Calendar Home

One Hundred and Twenty Ninth Session

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

Students looking for the 2015-2016 - 2020-2021 Calendars, please use the dropdown menu above to the right of your screen. For calendars prior to the 2015-2016 Academic Calendar, please click here

About this Calendar

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

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

For information on how to use these features, please see our FEAS Calendar User Guide.

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Glossary

Academic Plan

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

Academic Program

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

Associate Dean (Academic)

In charge of undergraduate studies for the Faculty.

AU

Academic Units, numerically equal to CEAB Accreditation Units.

Board of Trustees

The senior administrative body of the University.

BTech

Bachelor of Mining Engineering Technology

Bursary

Financial award for a student in need.

Calendar

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

CEAB

Canadian Engineering Accreditation Board.
CS: Complementary Studies

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

Confidential Examination

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

Core

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

Corequisites

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

Credit

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

Dean

The Chief Executive Officer of the Faculty.

Department

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

ECGPA

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

EGGPA

Engineering Graduation Grade Point Average - see Regulation 3 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.

**ETGPA**

Engineering Term Grade Point Average - see Regulation 3 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, Winter and Summer 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 deportment 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 2022. See Sessional Dates for a complete list: https://www.queensu.ca/registrar/key-dates

September 2022

3  Residence move-in day
4  Welcoming Ceremony for new students
5  Labour Day (University closed. Classes will not be held)
19  Last day to register without extra fee. After this date, students must appeal in writing to the Operations Committee for permission to register late.
30  Last day to apply to graduate for Fall Degree List

October 2022

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

November 2022

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

1  Last day to drop Fall Term course without Faculty Permission
7  Last date to apply for accommodation for an official examination conflict for the December examination period.
15  Last date to apply for admission to the Upper-Year program at Bader College for Winter term.
December 2022

1. Last day to apply for admission to Dual Degree in Arts and Science for the next Winter Term
2. First day to apply to graduate for Spring 2023 Degree List
3. Last day to apply for an Academic Plan Change (discipline change)

January 2023

13. Last day to apply for the exchange program for 2022-2023 (tentative)
16. Extended Program classes begin for APSC 111, APSC 131, APSC 171
16. Last day to apply to rewrite a First Year Fall course examination (APSC 111, APSC 131, APSC 151 and APSC 171) which take place in February Reading Week
18. Academic Plan (Discipline) Orientation for First Year Students begins
20. Last day to withdraw from degree program without failure of year
20. Last day to add a Fall Extended Program course
20. Last day to cancel an application to rewrite a First Year Fall course examination without academic penalty
27. Last day to drop a Fall Extended Program course

February 2023

1. Academic Plan Selection for First Year Students begins on SOLUS (tentative)
17. Last day of classes for Extended Program (APSC 111, APSC 131, APSC 171)
20. Academic Plan Selection for First Year Students ends on SOLUS (TENTATIVE)
21-24. Extended Program Fall course examinations
27. Extended Program classes begin for APSC 112, APSC 132, APSC 172
28. Last day to apply to graduate for Spring 2023 Degree List

March 2023

7. Last date to apply for accommodation for an official examination conflict for the April examination period
31. Last day to apply for admission to upper year courses at Bader College for Spring-Summer session

April 2023
1 Last day to apply for admission to Dual Degree in Arts and Science for the Summer Term
6 Last day to add a Winter Extended Program course with permission of the Associate Dean (Academic)
7 Good Friday (Classes not held)
10 Last day to drop a Winter Extended Program course

**May 2023**

1 Extended Program Fees due
1 Summer tuition fees are due in full for summer term classes
1 Extended Program Spring Term begins
12 Last day for eligible students in the regular First Year program to register to rewrite exams for Winter First Year courses (APSC 112, APSC 132, APSC 172, and APSC 174)
22 Victoria Day (University closed. Classes will not be held)
26 Last day to withdraw from rewrite exams for Winter First Year courses

**June 2023**

NOTE: Spring 2023 Convocation dates will be published by the Office of the University Registrar in November 2022. Refer to [http://www.queensu.ca/registrar/convocation](http://www.queensu.ca/registrar/convocation) to view these dates

1 Last day to apply to transfer into the Faculty of Engineering and Applied Science for the Fall term
1 Last day to apply for Dual Degree Program for the next Fall-Winter session
9 Last day to apply for supplemental examination privileges
9 Extended Program classes end
12-15 Extended Program Winter course examinations

**July 2023**

1 Canada Day (No classes held)
11-29 Summer class selection period for Fall and Winter Term classes (TENTATIVE)
15 First date to apply in SOLUS to graduate in Fall 2023 (TENTATIVE)
31 Last date to apply for admission to the Upper-Year program at the Bader College for Fall term
31 Last date to apply for an Academic Plan Change (discipline change) for the Fall term
August 2023

1  Civic Holiday (University closed. Classes will not be held)

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

August 30, 31 & September 1 2023 - Sept SUPPLEMENTAL 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 Applied Science in Engineering. Five-year plans, which include an Internship, lead to the degree of Bachelor of Applied Science in Engineering with Professional Internship. The codes for these plans and the prefix used throughout this Calendar for the courses in those disciplines are given below. The First Year is common to all academic plans.

<table>
<thead>
<tr>
<th>Program</th>
<th>Program Code</th>
<th>Course Prefix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Engineering</td>
<td>CHEE</td>
<td>CHEE</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>CIVL</td>
<td>CIVL</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>CMPE</td>
<td>SOFT, CMPE or ELEC</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>ELEC</td>
<td>ELEC</td>
</tr>
<tr>
<td>Engineering Chemistry</td>
<td>ENCH</td>
<td>ENCH</td>
</tr>
<tr>
<td>Engineering Physics</td>
<td>ENPH</td>
<td>ENPH</td>
</tr>
<tr>
<td>Geological Engineering</td>
<td>GEOE</td>
<td>GEOE</td>
</tr>
<tr>
<td>Mathematics and Engineering</td>
<td>MTHE</td>
<td>MTHE</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>MECH</td>
<td>MECH</td>
</tr>
<tr>
<td>Mechatronics and Robotics</td>
<td>MREN</td>
<td>MREN</td>
</tr>
<tr>
<td>Mining Engineering</td>
<td>MINE</td>
<td>MINE</td>
</tr>
<tr>
<td>Faculty Courses</td>
<td></td>
<td>APSC</td>
</tr>
<tr>
<td>Multi-department Courses</td>
<td></td>
<td>MDEP</td>
</tr>
</tbody>
</table>

There are five major components to each of these academic plans:
MATHEMATICS: Elements of algebra, calculus, differential equations, probability, statistics and numerical analysis;
NATURAL SCIENCE: Elements of Physics and Chemistry, and in some plans, elements of Earth and Life Sciences;
COMPLEMENTARY STUDIES: Topics in Engineering Economics, Communications, Management, Humanities and Social Sciences, Linkage and Professional Issues, and Performance Arts and Languages. Engineering Sciences and Engineering Design constitute about half of the plan in each case, with the other components approximately equal to each other in weight.
ENGINEERING SCIENCE: Extension of Mathematics and Basic Sciences toward creative applications;
ENGINEERING DESIGN: The application of Mathematics, Science, and Engineering Science to meet specific needs; and

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

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

Academic Plan and Course Symbols and Codes: Plans are identified by a four-letter code (see table above). Courses are identified by: A four-letter code and a three digit number (the first of which identifies the year of the plan in which the course would normally be taken - i.e. 174 is a year one course); a letter; 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, S | 3.3
  This is a Faculty course normally taken in the first year. It is offered in the Winter term, will have 36 fifty-minute lectures (3 lectures per week); no lab; twelve hours in tutorials (one hour per week). The final number is the sum of the accreditation units, and represents the weight of the course. A section on Course Descriptions appears elsewhere in this Calendar.

Requirements for Graduation The minimum number of Accreditation Units required for graduation is stipulated for each of the academic plans in the Faculty. These minimum form part of the curriculum of each plan as described later in the Degree Program section of this Calendar. The minimum number varies from plan to plan, but in the current year all are greater than 1850 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:

<table>
<thead>
<tr>
<th>Category</th>
<th>Minimum AUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>195AU</td>
</tr>
<tr>
<td>NS</td>
<td>195AU</td>
</tr>
</tbody>
</table>

Mathematics
Natural Science
2. The sum of the AUs in these five categories shown above must be at least **1850 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:

<table>
<thead>
<tr>
<th>Category</th>
<th>Minimum AUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>M+NS</td>
<td>420AU</td>
</tr>
<tr>
<td>ES+ED</td>
<td>900AU</td>
</tr>
</tbody>
</table>

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 Applied Thermodynamics I F | 3.5**
  An introductory course in thermodynamics. Topics include: properties and behaviour or 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.

**APSC 199 English support for Engineers**

Students in all academic plans are required to demonstrate the ability to communicate effectively in written English. Within their first year, students registering in APSC 199 must attempt a written English proficiency test. Students who do not pass on the initial attempt will have further opportunities, and need to pass the test to meet the prerequisite for APSC 200, the second year design course. A student must pass APSC 199 to be eligible for graduation.

**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 one extra 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 https://my.engineering.queensu.ca/Current-Students/dual-degrees

**Queen's University Internship Program (QUIP)**

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.)

Job openings under this program are posted online by Career Services. A student will have access once they register in the Internship Program.

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 up to one year (one or two terms) 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://my.engineering.queensu.ca/Current-Students/Exchange-Programs/index.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 Division of Student Affairs web page at https://www.queensu.ca/studentaffairs/, or the Faculty general web address at http://engineering.queensu.ca/. The services of the Engineering Society are listed at http://engsoc.queensu.ca.

**First Year Studies**

**First Year Studies, B.A.Sc.**

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

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

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

Details about these streams are listed in the calendar at:

First Year Curriculum

- APSC 199 English Proficiency for Engineers FW, S | K0.2
- APSC 101 Engineering Design and Practice F | K3.5
- APSC 102 Experimentation F/W | K2
- APSC 111 Physics I F | 3.3
- APSC 131 Chemistry and Materials F | 3.3
- APSC 143 Introduction to Computer Programming for Engineers F | K3.3
- APSC 151 Earth Systems Engineering F | 3.3
- APSC 171 Calculus I F | K3.3
- APSC 103 Engineering Client-based Design Project W | K3.5
- APSC 112 Physics II W | 3.3
  or
- APSC 114 Electricity and Magnetism W | 3.3
- APSC 132 Chemistry of Natural and Engineered Systems W | 3.3
- APSC 162 Engineering Graphics W | 2.5
- APSC 172 Calculus II W | 3.3
- APSC 174 Introduction to Linear Algebra W, S | 3.3

Minimum Total Credits: 43.1

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 Help Desk

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 Engineering Society (EngSoc) Engvents

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

The Engineering Society (EngSoc) 'EngLinks' Tutoring System

For help using the EngSoc 'EngLinks' Tutoring 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 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**

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

Ancillary Fees

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

(CHE1) Chemical Engineering - Chemical Process Engineering Sub-Plan, B.A.Sc.(Class of 2024)

Second Year CORE 2021-2022

- 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 | 4.75
- ENCH 212 Principles of Chemical Reactivity F | 4
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- CHEE 210 Thermodynamics of Energy Conversion Systems W | 3.5
- CHEE 218 Laboratory Projects I W | 2.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 245 Applied Organic Chemistry I W | 4.75

Minimum Total Units: 45

Third Year CORE 2022-2023

- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 315 Laboratory Projects II F/W | 4
- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 330 Heat and Mass Transfer F | 3.5
- CHEE 380 Biochemical Engineering F | 3.5
- CHEE 319 Process Dynamics and Control W | 3.5
- CHEE 323 Industrial Catalysis W | 3.5
- CHEE 331 Design of Unit Operations W | K4.5
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- CHEE 371 Mitigation of Industrial Pollution W | 3.5
- ELECTIVE - Complementary Studies (3 credits) F/W | 3
- ELECTIVE - Technical Elective (minimum 3 credits) F/W | 3

Minimum Total Units: 43

NOTE: It is recommended that students take APSC 221 during the fall term in preparation for CHEE 331 in the winter term.

Fourth Year CORE 2023-2024

- CHEE 418 Strategies for Process Investigations F | 3.5
- CHEE 471 Chemical Process Design FW | K7
- CHEE 412 Transport Phenomena W | 3.5
- ELECTIVE - Complementary Studies (6 credits) F/W | 6
- ELECTIVE - Technical Elective (minimum 9 credits) F/W | 9

Plus One Of:

- APSC 400 NOT OFFERED 2022-2023 Technology, Engineering & Management (TEAM) FW* | K7
  OR
- APSC 401 Interdisciplinary Projects W | K4.5 Plus a TECH elective from either Group A or Group B1.
  OR
- APSC 480 NOT OFFERED 2022-23 - Multi-disciplinary Industry Engineering Design Project FW | K9
  OR
- CHEE 410 Engineering Innovation and Entrepreneurship W | K3.5 Plus a TECH Elective from either Group A or Group B2.
  OR
- CHEE 420 Laboratory Projects III W | K4 Plus a TECH Elective from either Group A or Group B3.
  OR
- CHEE 421 Research Project FW | K7
  OR
- MINE 434 Project Report F/W | 4 Plus a TECH Elective from either Group A or Group B4.

Minimum Total Credits: 36

1 APSC 401 and a TECH elective from either Group A or Group B count together as one choice. This technical elective is counted separate from the technical elective requirements of the program.

2 CHEE 410 and a TECH elective from either Group A or Group B count together as one choice. This technical elective is counted separate from the technical elective requirements of the program.
Technical Electives

Students in the CHE1 Process Engineering sub-plan must take four (4) technical elective (TECH) courses - two (2) technical elective courses from the Technical Electives Group A list and two (2) courses from either the Technical Electives Group A or Technical Electives Group B list.

For students interested in a Minerals Processing/Metal Extraction focus the recommended course sequence is 1. MINE 267 (Winter term of 3rd year), 2. MINE 451 (Fall term of 4th year), and MINE 434 (Winter term of 4th year).

Chemical Process and Bioengineering Sub-plan: Technical Electives

Complementary Studies

Students choose a total of 9 credits from the approved Lists A or B, of which 3 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 APSC 221 (this is a CORE course).

Communications

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

(CHE1) Chemical Engineering - Chemical Process Engineering Sub-Plan, B.A.Sc. (Class of 2023)

Second Year CORE 2020-2021

- 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 | 4.75
- ENCH 212 Principles of Chemical Reactivity F | 4
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- CHEE 210 Thermodynamics of Energy Conversion Systems W | 3.5
- CHEE 218 Laboratory Projects I W | 2.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 245 Applied Organic Chemistry I W | 4.75

Minimum Total Units: 45

Third Year CORE 2021-2022

- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 315 Laboratory Projects II F/W | 4
- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 330 Heat and Mass Transfer F | 3.5
- CHEE 380 Biochemical Engineering F | 3.5
- CHEE 319 Process Dynamics and Control W | 3.5
- CHEE 323 Industrial Catalysis W | 3.5
- CHEE 331 Design of Unit Operations W | K4.5
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- CHEE 371 Mitigation of Industrial Pollution W | 3.5
- ELECTIVE - Technical Elective (Minimum 3 Credits) F/W | 3
- ELECTIVE - Complementary Studies (3 Credits) F/W | 3

Minimum Total Units: 43

Fourth Year CORE 2022-2023

- CHEE 418 Strategies for Process Investigations F | 3.5
- CHEE 412 Transport Phenomena W | 3.5
- CHEE 471 Chemical Process Design FW | K7
- ELECTIVE - Technical Elective (minimum 9 credits) F/W | 9
- ELECTIVE - Complementary Studies (6 credits) F/W | 6

Plus One Of:

- APSC 400 NOT OFFERED 2022-2023 Technology, Engineering & Management (TEAM) FW* | K7
  OR
- APSC 401 Interdisciplinary Projects W | K4.5 Plus a TECH elective from either Group A or Group B1.
  OR
- APSC 480 NOT OFFERED 2022-23 - Multi-disciplinary Industry Engineering Design Project FW | K9
  OR
- CHEE 410 Engineering Innovation and Entrepreneurship W | K3.5 Plus a TECH Elective from either Group
  A or Group B2. OR
- CHEE 420 Laboratory Projects III W | K4 Plus a TECH Elective from either Group A or Group B3.
  OR
- CHEE 421 Research Project FW | K7
Minimum Total Credits: 36

1 APSC 401 and a TECH elective from either Group A or Group B count together as one choice. This technical elective is counted separate from the technical elective requirements of the program.

2 CHEE 410 and a TECH elective from either Group A or Group B count together as one choice. This technical elective is counted separate from the technical elective requirements of the program.

3 CHEE 420 and a TECH elective from either Group A or Group B count together as one choice. This technical elective is counted separate from the technical elective requirements of the program.

4 MINE 434 and a TECH elective from either Group A or Group B count together as one choice. This technical elective is counted separate from the technical elective requirements of the program.

Technical Electives

Students in the CHE1 Process Engineering sub-plan must take four (4) technical elective (TECH) courses - two (2) technical elective courses from the Technical Electives Group A list and two (2) courses from either the Technical Electives Group A or Technical Electives Group B list.

For students interested in a Minerals Processing/Metal Extraction focus the recommended course sequence is 1. MINE 267 (Winter term of 3rd year), 2. MINE 451 (Fall term of 4th year), and MINE 434 (Winter term of 4th year).

Chemical Process and Bioengineering Sub-plan: Technical Electives

Complementary Studies

Students choose a total of 9 credits from the approved Lists A or B, of which 3 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 APSC 221 (this is a CORE course).

Communications

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

(CHE1) Chemical Engineering - Chemical Process Engineering Sub-Plan, B.A.Sc.(Class of 2025)

Second Year CORE 2022-2023

- 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 | 4.75
- ENCH 212 Principles of Chemical Reactivity F | 4
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- CHEE 210 Thermodynamics of Energy Conversion Systems W | 3.5
- CHEE 218 Laboratory Projects I W | 2.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 245 Applied Organic Chemistry I W | 4.75

Minimum Total Credits: 45

Third Year CORE 2023-2024

- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 315 Laboratory Projects II F/W | 4
- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 330 Heat and Mass Transfer F | 3.5
- CHEE 380 Biochemical Engineering F | 3.5
- CHEE 319 Process Dynamics and Control W | 3.5
- CHEE 323 Industrial Catalysis W | 3.5
- CHEE 331 Design of Unit Operations W | K4.5
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- CHEE 371 Mitigation of Industrial Pollution W | 3.5
- ELECTIVE - Complementary Studies (3 Credits) F/W | 3
- ELECTIVE - Technical Elective (Minimum 3 Credits) F/W | 3

Minimum Total Credits: 43

NOTE: It is recommended that students take APSC 221 during the fall term in preparation for CHEE 331 in the winter term.

Fourth Year CORE 2024-2025

- CHEE 418 Strategies for Process Investigations F | 3.5
- CHEE 471 Chemical Process Design FW | K7
- CHEE 412 Transport Phenomena W | 3.5
- ELECTIVE - Technical Elective (minimum 9 credits) F/W | 9
- ELECTIVE - Complementary Studies (6 credits) F/W | 6

Plus One Of:

- APSC 400 NOT OFFERED 2022-2023 Technology, Engineering & Management (TEAM) FW* | K7
  OR
- APSC 401 Interdisciplinary Projects W | K4.5 Plus a TECH elective from either Group A or Group B1.
Minimum Total Credits: 36

1 APSC 401 and a TECH elective from either Group A or Group B count together as one choice. This technical elective is counted separate from the technical elective requirements of the program.

2 CHEE 410 and a TECH elective from either Group A or Group B count together as one choice. This technical elective is counted separate from the technical elective requirements of the program.

3 CHEE 420 and a TECH elective from either Group A or Group B count together as one choice. This technical elective is counted separate from the technical elective requirements of the program.

4 MINE 434 and a TECH elective from either Group A or Group B count together as one choice. This technical elective is counted separate from the technical elective requirements of the program.

Technical Electives

Students in the CHE1 Process Engineering sub-plan must take four (4) technical elective (TECH) courses - two (2) technical elective courses from the Technical Electives Group A list and two (2) courses from either the Technical Electives Group A or Technical Electives Group B list.

For students interested in a Minerals Processing/Metal Extraction focus the recommended course sequence is 1. MINE 267 (Winter term of 3rd year), 2. MINE 451 (Fall term of 4th year), and MINE 434 (Winter term of 4th year).

Chemical Process and Bioengineering Sub-plan: Technical Electives

Complementary Studies

Students choose a total of 9 credits from the approved Lists A or B, of which 3 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 APSC 221 (this is a CORE course).

Communications

To meet the communications course requirement, students take APSC 293 and CHEE 361 (these are CORE courses).
(CHE2) Bioengineering - Biochemical, Biomedical, Bioenvironmental Sub-Plan B.A.Sc. (2023)

Second Year CORE 2020-2021

- 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 | 4.75
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- ENCH 212 Principles of Chemical Reactivity F | 4
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- CHEE 210 Thermodynamics of Energy Conversion Systems W | 3.5
- CHEE 218 Laboratory Projects I W | 2.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 245 Applied Organic Chemistry I W | 4.75

Minimum Total Credits: 46

Third Year CORE 2021-2022

- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 330 Heat and Mass Transfer F | 3.5
- CHEE 342 Environmental Biotechnology F | 3.5
- CHEE 380 Biochemical Engineering F | 3.5
- CHEE 315 Laboratory Projects II F/W | 4
- CHEE 319 Process Dynamics and Control W | 3.5
- CHEE 331 Design of Unit Operations W | K4.5
- CHEE 340 Biomedical Engineering W | 3.5
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- CHEE 371 Mitigation of Industrial Pollution W | 3.5
- ELECTIVE - Complementary Studies (3 Credits) F/W | 3

Minimum Total Credits: 43.5

NOTE: It is recommended that students take APSC 221 during the fall term in preparation for CHEE 331 in the winter term.

Fourth Year CORE 2022-2023

- CHEE 418 Strategies for Process Investigations F | 3.5
- CHEE 452 Transport Phenomena in Physiological Systems F | 3.5
- CHEE 471 Chemical Process Design FW | K7
- ELECTIVE - Technical Elective (Minimum 9 Credits) F/W | 9
• ELECTIVE - Complementary Studies (6 Credits) F/W | 6

Plus One Of:

• APSC 400 NOT OFFERED 2022-2023 Technology, Engineering & Management (TEAM) FW* | K7 OR
• APSC 401 Interdisciplinary Projects W | K4.5 Plus a TECH elective from either Group A or Group B¹ OR
• APSC 480 NOT OFFERED 2022-23 - Multi-disciplinary Industry Engineering Design Project FW | K9 OR
• CHEE 408 Bioengineering Research Project FW | K7 OR
• CHEE 410 Engineering Innovation and Entrepreneurship W | K3.5 Plus a TECH elective from either Group A or Group B². OR
• CHEE 420 Laboratory Projects III W | K4 Plus a TECH elective from either Group A or Group B³.

Minimum Total Credits: 36

¹ APSC 401 plus a technical elective from either Group A or Group B count together as one choice. This technical elective is counted separate from the technical elective requirements of the program.
² CHEE 410 plus a technical elective from either Group A or Group B count together as one choice. This technical elective is counted separate from the technical elective requirements of the program.
³ CHEE 420 plus a technical elective from either Group A or Group B count together as one choice. This technical elective is counted separate from the technical elective requirements of the program.

Technical Electives

Students in the CHE2 Bioengineering - Biochemical, Biomedical, Bioenvironmental sub-plan take one technical elective (TECH) course from the Technical Electives Group A list and two (2) courses from either the Technical Electives Group A or Technical Electives Group B technical electives list. NOTE: Students in the Bioengineering option are encouraged to select electives from the relevant elective groupings.

Chemical Process and Bioengineering Sub-plan: Technical Electives

Complementary Studies

Students choose a total of 9 credits from the approved Lists A or B, of which 3 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 APSC 221 (this is a CORE course).

Communications

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

(CHE2) Bioengineering - Biochemical, Biomedical, Bioenvironmental Sub-Plan, B.A.Sc. (2024)

Second Year CORE 2021-2022

- 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 | 4.75
- ENCH 212 Principles of Chemical Reactivity F | 4
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- CHEE 210 Thermodynamics of Energy Conversion Systems W | 3.5
- CHEE 218 Laboratory Projects I W | 2.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 245 Applied Organic Chemistry I W | 4.75

Minimum Total Credits: 46

Third Year CORE 2022-2023

- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 330 Heat and Mass Transfer F | 3.5
- CHEE 342 Environmental Biotechnology F | 3.5
- CHEE 380 Biochemical Engineering F | 3.5
- CHEE 315 Laboratory Projects II F/W | 4
- CHEE 319 Process Dynamics and Control W | 3.5
- CHEE 331 Design of Unit Operations W | K4.5
- CHEE 340 Biomedical Engineering W | 3.5
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- CHEE 371 Mitigation of Industrial Pollution W | 3.5
- ELECTIVE - Complementary Studies (3 Credits) F/W | 3

Minimum Total Credits: 43.5
NOTE: It is recommended that students take APSC 221 during the fall term in preparation for CHEE 331 in the winter term.

Fourth Year CORE 2023-2024

- CHEE 418 Strategies for Process Investigations F | 3.5
- CHEE 452 Transport Phenomena in Physiological Systems F | 3.5
- CHEE 471 Chemical Process Design FW | K7
- ELECTIVE - Technical Elective (Minimum 9 Credits) F/W | 9
- ELECTIVE - Complementary Studies (6 Credits) F/W | 6

Plus One Of:

- APSC 400 NOT OFFERED 2022-2023 Technology, Engineering & Management (TEAM) FW* | K7
  OR
- APSC 401 Interdisciplinary Projects W | K4.5 Plus a TECH elective from either Group A or Group B
  OR
- APSC 480 NOT OFFERED 2022-23 - Multi-disciplinary Industry Engineering Design Project FW | K9
  OR
- CHEE 408 Bioengineering Research Project FW | K7
  OR
- CHEE 410 Engineering Innovation and Entrepreneurship W | K3.5 PLUS a technical elective from either Group A or Group B
  OR
- CHEE 420 Laboratory Projects III W | K4 Plus a TECH elective from either Group A or Group B

Minimum Total Credits: 36

1 APSC 401 plus a technical elective from either Group A or Group B count together as one choice. This technical elective is counted separate from the technical elective requirements of the program.
2 CHEE 410 plus a technical elective from either Group A or Group B count together as one choice. This technical elective is counted separate from the technical elective requirements of the program.
3 CHEE 420 plus a technical elective from either Group A or Group B count together as one choice. This technical elective is counted separate from the technical elective requirements of the program.

Technical Electives

Students in the CHE2 Bioengineering - Biochemical, Biomedical, Bioenvironmental sub-plan take one technical elective (TECH) course from the Technical Electives Group A list and two (2) courses from either the Technical Electives Group A or Technical Electives Group B technical electives list. NOTE: Students in the Bioengineering option are encouraged to select electives from the relevant elective groupings.

Chemical Process and Bioengineering Sub-plan: Technical Electives

Complementary Studies
Students choose a total of 9 credits from the approved Lists A or B, of which 3 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 APSC 221 (this is a CORE course).

**Communications**

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

*(CHE2) Bioengineering - Biochemical, Biomedical, Bioenvironmental Sub-Plan, B.A.Sc. (2025)*

**Second Year CORE 2022-2023**

- 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 | 4.75
- ENCH 212 Principles of Chemical Reactivity F | 4
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- CHEE 210 Thermodynamics of Energy Conversion Systems W | 3.5
- CHEE 218 Laboratory Projects I W | 2.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 245 Applied Organic Chemistry I W | 4.75

Minimum Total Credits: 46

**Third Year CORE 2023-2024**

- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 330 Heat and Mass Transfer F | 3.5
- CHEE 342 Environmental Biotechnology F | 3.5
- CHEE 380 Biochemical Engineering F | 3.5
- CHEE 315 Laboratory Projects II F/W | 4
- CHEE 319 Process Dynamics and Control W | 3.5
- CHEE 331 Design of Unit Operations W | K4.5
- CHEE 340 Biomedical Engineering W | 3.5
• CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
• CHEE 371 Mitigation of Industrial Pollution W | 3.5
• ELECTIVE - Complementary Studies (3 Credits) F/W | 3

Minimum Total Credits: 43.5

NOTE: It is recommended that students take APSC 221 during the fall term in preparation for CHEE 331 in the winter term.

Fourth Year CORE 2024-2025

• CHEE 418 Strategies for Process Investigations F | 3.5
• CHEE 452 Transport Phenomena in Physiological Systems F | 3.5
• CHEE 471 Chemical Process Design FW | K7
• ELECTIVE - Technical Elective (Minimum 9 Credits) F/W | 9
• ELECTIVE - Complementary Studies (6 Credits) F/W | 6

Plus One Of:

• APSC 400 NOT OFFERED 2022-2023 Technology, Engineering & Management (TEAM) FW* | K7
  OR
• APSC 401 Interdisciplinary Projects W | K4.5 Plus a TECH Elective from either Group A or Group B¹.
  OR
• APSC 480 NOT OFFERED 2022-23 - Multi-disciplinary Industry Engineering Design Project FW | K9
  OR
• CHEE 408 Bioengineering Research Project FW | K7
  OR
• CHEE 410 Engineering Innovation and Entrepreneurship W | K3.5 PLUS technical elective from either
  Group A or Group B².
  OR
• CHEE 420 Laboratory Projects III W | K4 Plus a TECH elective from either Group A or Group B³.

Minimum Total Credits: 36

¹ APSC 401 plus a technical elective from either Group A or Group B count together as one choice. This technical
elective is counted separate from the technical elective requirements of the program.
² CHEE 410 plus a technical elective from either Group A or Group B count together as one choice. This technical
elective is counted separate from the technical elective requirements of the program.
³ CHEE 420 plus a technical elective from either Group A or Group B count together as one choice. This technical
elective is counted separate from the technical elective requirements of the program.

Technical Electives
Students in the CHE2 Bioengineering - Biochemical, Biomedical, Bioenvironmental sub-plan take one technical elective (TECH) course from the Technical Electives Group A list and two (2) courses from either the Technical Electives Group A or Technical Electives Group B technical electives list. NOTE: Students in the Bioengineering option are encouraged to select electives from the relevant elective groupings.

**Chemical Process and Bioengineering Sub-plan: Technical Electives**

**Complementary Studies**

Students choose a total of 9 credits from the approved Lists A or B, of which 3 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 APSC 221 (this is a CORE course).

**Communications**

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

**Chemical Process and Bioengineering Sub-plan: Technical Electives**

**TECHNICAL ELECTIVES**

Should a course on the technical elective list already be a core course for a sub-plan, then that course is excluded as an elective for that sub-plan. For example ...

- CHEE 340 and CHEE 342 are core courses for the CHE2 sub-plan and thus cannot be counted as electives.
- CHEE 323 is a core course for the CHE1 sub-plan and thus cannot be counted as an elective.
- APSC 250 has CHEE 229 as an exclusion (a core course taken by CHE2) and thus cannot be counted as an elective.
- APSC 303 counts as a Group A Technical Elective upon successful completion of internship.

PLEASE 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 this upcoming year.
GROUP A TECHNICAL ELECTIVES

Biomedical

- CHEE 340 Biomedical Engineering W | 3.5
- CHEE 440 Pharmaceutical Technology W | 3.5
- MECH 393 Biomechanical Product Development W | 3.5
- MECH 492 Biological Fluid Dynamics F | 3.5

Energy, Energy Resources, and Petroleum Engineering

- CHEE 270 ChemEtronics F | K3
- CHEE 363 Electrochemical Engineering* W | 3.5
- CHEE 414 Foundations of the Oil and Gas Industry W | K3.5
- MECH 430 NOT OFFERED 2022-2023 - Thermal Systems Design W | 4
- MECH 435 Internal Combustion Engines W | 3.5
- MECH 437 NOT OFFERED 2022-2023 - Fuel Cell Technology F | 3.5
- MECH 439 NOT OFFERED 2022-2023 Turbomachinery W | 3.5

Environmental

- CHEE 342 Environmental Biotechnology F | 3.5
- CHEE 484 NOT OFFERED 2022-2023 Bioremediation W | 3.5
- CIVL 371 Groundwater Engineering F | 3.75
- CIVL 372 Water and Wastewater Engineering W | 4
- CIVL 451 Lake, Reservoir and Coastal Engineering F | 3.75
- CIVL 471 Subsurface Contamination F | 4

Materials Processing

- CHEE 323 Industrial Catalysis W | 3.5
- CHEE 324 NOT OFFERED 2022-2023 Organic Process Development W | 3.5
- CHEE 460 Applied Surface and Colloid Science F | 3.5
- CHEE 490 NOT OFFERED 2022-2023 Polymer Formulations and Processing Technology W | 3.5
- MECH 270 Materials Science and Engineering F | 3.5
- MECH 370 Principles of Materials Processing F | 3.5
- MECH 371 Fracture Mechanics and Dislocation Theory W | 3.5
- MECH 476 Engineering of Polymers and Composite Materials W | 3.5

Minerals Processing

- MINE 267 Applied Chemistry for Mining W | 3.5
- MINE 331 Methods of Mineral Separation F | 4.5
- MINE 335 Mineral Processing F | 3
- MINE 451 Chemical Extraction of Metals F | 4
- MNTC 306 Mineral Processing Unit Operations O/L | 3
- MNTC 311 Ore Body Modelling and Resource Estimation O/L | 4.5
- MNTC 415 Metal Extraction Processes O/L | 4

Process Automation, Applied Mathematics & Modeling

- CHEE 434 NOT OFFERED 2022-2023 Process Control II W | 3.5
- ELEC 278 Fundamentals of Information Structures F | 4
- MECH 480 Airplane Aerodynamics and Performance W | 3.5

General

- APSC 303 Professional Internship | 3.5
- APSC 381 Advanced Design and Skills for Innovation W | K3.5
- APSC 401 Interdisciplinary Projects W | K4.5

GROUP B TECHNICAL ELECTIVES

Applied Chemistry

- ENCH 213 Introduction to Chemical Analysis F | 4.75
- ENCH 222 Methods of Structure Determination W | 3.75
- ENCH 311 Mechanistic Organic Chemistry F | 3.5
- ENCH 312 Transition Metal Chemistry F | 3.5
- ENCH 326 Environmental and Green Chemistry W | 3
- ENCH 411 Advanced Analytical Chemistry F | 3
- ENCH 422 Not Offered 2022-2023 Synthetic Organic Chemistry W | 3.5
- ENCH 424 Polymer Chemistry W | 3

Applied Mathematics & Statistics

- MTHE 339 NOT OFFERED 2022-2023 Evolutionary Game Theory W | 3

Biosciences

- APSC 250 NOT OFFERED 2022-2023 Biology Through an Engineering Lens S/OL | K3.5
- BCHM 315 Proteins and Enzymes F | 3
- BIOL 335 Limnology and Aquatic Ecology F | 3
- BIOM 300 Modeling Techniques in Biology W | 3
- ENCH 323 Biological Chemistry W | 3

Energy Resources/Petroleum Engineering

- GEOE 238 Surficial Processes, Sedimentation and Stratigraphy W | 4

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

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

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

Civil Engineering, B.A.Sc. (Class of 2023)

Second Year CORE 2020-2021

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- APSC 293 Engineering Communications I F/W/S | K1
- CIVL 200 Professional Skills I F | K2.5
- CIVL 210 Chemistry for Civil Engineers F | 4.5
- CIVL 215 Materials for Civil Engineers W | 4.5
- 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
- MTHE 224 Applied Mathematics for Civil Engineers F | 4.2
- Complementary Studies- Humanities & Social Sciences List A F | &nbsp;3

Minimum Total Credits: 44.45

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

Third Year CORE 2021-2022
- CIVL 300 Professional Skills II F | K2.5
- CIVL 330 Structural Analysis F | 3.75
- CIVL 331 Structural Steel and Timber 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 371 Groundwater Engineering F | 3.75
- CIVL 372 Water and Wastewater Engineering W | 4
- Complementary Studies - Humanities & Social Sciences List A F | 3
- Complementary Studies - Linkage and Professional Issues List B W | 3

Minimum Total Credits: 39.5

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

Fourth Year CORE 2022-2023

- CIVL 400 Professional Skills III F | K2.5
- CIVL 460 Civil Engineering Design and Practice IV FW | K6
- Complementary Studies- List A or B FW | 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, please contact the Undergraduate Program Assistant.

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

*APSC 303 can count as a Free Elective (3.5 units) for students who have successfully completed a Queen's Undergraduate Internship Program (QUIP).
Civil Engineering, B.A.Sc. (Class of 2024)

Second Year CORE 2021-2022

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- APSC 293 Engineering Communications I F/W/S | K1
- CIVL 200 Professional Skills I F | K2.5
- CIVL 210 Chemistry for Civil Engineers F | 4.5
- CIVL 215 Materials for Civil Engineers W | 4.5
- 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
- MTHE 224 Applied Mathematics for Civil Engineers F | 4.2
- Complementary Studies- Humanities & Social Sciences List A F | 3

Minimum Credits: 44.45

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

Third Year CORE 2022-2023

- CIVL 300 Professional Skills II F | K2.5
- CIVL 330 Structural Analysis F | 3.75
- CIVL 331 Structural Steel and Timber 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 371 Groundwater Engineering F | 3.75
- Complementary Studies - Humanities & Social Sciences List A F | 3
- CIVL 372 Water and Wastewater Engineering W | 4
- Complementary Studies - Linkage and Professional Issues List B W | 3

Minimum Credits: 39.5

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

Fourth Year CORE 2023-2024

- CIVL 400 Professional Skills III F | K2.5
- CIVL 460 Civil Engineering Design and Practice IV FW | K6
- Complementary Studies- List A or B F | 3
- Electives F&W | 25.75

Minimum Credits: 37.25
Electives

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

Civil Engineering: Technical Electives

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

- Any 3 credit course appearing anywhere in the Applied Science calendar, in the course descriptions list, in the requirements for any academic plan, or in the lists of eligible complementary studies courses
- Any course at the 100 level or higher from the Arts and Science calendar with any of the following subject codes: ANAT, BCHM, BIOL, CDNS, CHEM, CISC, COGS, COMM, DEV, 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, please contact the Undergraduate Program Assistant.

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

*APSC 303 can count as a Free Elective (3.5 units) for students who have successfully completed a Queen’s Undergraduate Internship Program (QUIP).

Civil Engineering, B.A.Sc. (Class of 2025)

Second Year CORE 2022-2023

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- APSC 293 Engineering Communications I F/W/S | K1
- CIVL 200 Professional Skills I F | K2.5
- CIVL 210 Chemistry for Civil Engineers F | 4.5
- CIVL 215 Materials for Civil Engineers W | 4.5
- 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
- MTHE 224 Applied Mathematics for Civil Engineers F | 4.2
- Complementary Studies - List A F | 3

Minimum Total Credits: 44.45

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

Third Year CORE 2023-2024

- CIVL 300 Professional Skills II F | K2.5
- CIVL 330 Structural Analysis F | 3.75
- CIVL 331 Structural Steel and Timber 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 371 Groundwater Engineering F | 3.75
- CIVL 372 Water and Wastewater Engineering W | 4
- Complementary Studies - List A F | 3
- Complementary Studies - List B W | 3

Minimum Total Credits: 39.5

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

Fourth Year CORE 2024-2025

- CIVL 400 Professional Skills III F | K2.5
- CIVL 460 Civil Engineering Design and Practice IV FW | K6
- Complementary Studies - List A or B F | 3
- Electives F&W 25.75

Minimum Total Credits: 37.25

Electives

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

Civil Engineering: Technical Electives

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

- Any 3 credit course appearing anywhere in the Applied Science calendar, in the course descriptions list, in the requirements for any academic plan, or in the lists of eligible complementary studies courses
- Any course at the 100 level or higher from the Arts and Science calendar with any of the following subject codes: ANAT, BCHM, BIOL, CDNS, CHEM, CISC, COGS, COMM, DEV, DEVS, GEO, 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, please contact the Undergraduate Program Assistant.

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

*APSC 303 can count as a Free Elective (3.5 units) for students who have successfully completed a Queen's Undergraduate Internship Program (QUIP).
Civil Engineering: Technical Electives

Technical Electives List 1

- CIVL 430 Reinforced Concrete Design F | 3.75
- CIVL 442 Geotechnical Design F | 3.75
- CIVL 450 Municipal Hydraulics F |
- CIVL 451 Lake, Reservoir and Coastal Engineering F | 3.75
- CIVL 472 Water Treatment W | 3.75
- CIVL 473 Water Resources System W | 3.75
- CIVL 431 Infrastructure Rehabilitation W | 4
- CIVL 436 Prestressed Concrete W | 4
- CIVL 443 Geoenvironmental Design W | 4
- CIVL 455 River Engineering F | 4
- CIVL 471 Subsurface Contamination F | 4
- CIVL 490 Selected Topics in Civil Engineering F | 3.75
- CIVL 491 Selected Topics in Civil Engineering W | 3.75
- CIVL 500 Civil Engineering Thesis FW | K4

Technical Electives List 2

- APSC 250 NOT OFFERED 2022-2023 Biology Through an Engineering Lens S/OL | K3.5
- APSC 381 Advanced Design and Skills for Innovation W | K3.5
- APSC 480 NOT OFFERED 2022-2023 - Multi-disciplinary Industry Engineering Design Project FW | K9
- CHEE 330 Heat and Mass Transfer F | 3.5
- CHEE 342 Environmental Biotechnology F | 3.5
- CHEE 371 Mitigation of Industrial Pollution W | 3.5
- CHEE 380 Biochemical Engineering F | 3.5
- CHEE 484 NOT OFFERED 2022-2023 Bioremediation W | 3.5
- GEOE 313 Engineering Geology and Geomechanics W | 4
- GEOE 333 Terrain Evaluation W | 4
- GEOE 414 Foundations of the Oil and Gas Industry W | 3.5
- MECH 230 Applied Thermodynamics I F | 3.5
- MECH 341 Fluid Mechanics II W | 3.5
- MECH 346 Heat Transfer W | 3.5
- MECH 371 Fracture Mechanics and Dislocation Theory W | 3.5
- MECH 394 Frontiers in Biomechanical Engineering F | 3.5
- MECH 424 NOT OFFERED 2022-2023 - Sustainable Product Design F | 3.5
- MECH 444 Computational Fluid Dynamics F | 3.5
- MECH 465 Computer-Aided Design F | 3.5
- MECH 495 Ergonomics and Design F | 3.5
- MINE 201 Introduction to Mining and Mineral Processing F | 4
- MINE 272 Applied Data Science W | 4.5
Computer Engineering

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

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

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

Computer Engineering, B.A.Sc. (Class of 2023)

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

1. Satisfy the minimum Accreditation Units (AU) set by ECE in each CEAB category.
2. Have at least 5 four-hundred level elective courses.
3. Have at least 3 courses from Electives Lists A, B and C that satisfy the Department criteria for qualified accreditation units in the categories of engineering science and engineering design.
4. Have at least 3 courses from Elective List B.
5. Counting required core courses and elective courses in all four years, result in a total of no fewer than 157.5 credits for the complete program.

Available combinations of elective courses are subject to timetabling constraints.

Second Year CORE 2020-2021

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- 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
- ELEC 274 Computer Architecture W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 279 Introduction to Object Oriented Programming W | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
  or
- MTHE 235 NOT OFFERED 2022-2023 - Differential Equations for Electrical and Computer Engineers F | 3.5

Minimum Total Credits: 44.75

Third Year CORE 2021-2022

- CMPE 365 Algorithms I F | 4
- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- ELEC 373 Computer Networks W | 3.5
- ELEC 374 Digital Systems Engineering W | 4.25
- ELEC 377 Operating Systems F | 4
- ELEC 390 Principles of Design and Development W | K3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- CMPE 223 Software Specifications W | 3
  or
- CMPE 320 Fundamentals of Software Development F | 4
- Technical Electives (choose 1) F/W | 3
- Complementary Studies F/W | 3

Total Credits: 38.75 or 39.75
Fourth Year CORE 2022-2023

- ELEC 498 Computer Engineering Project FW | K7 *
- Technical Electives F/W | 20.1 or 21.1
- Complementary Studies F/W | 3

Minimum Total Credits: 30.1 or 31.1

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

Electives

Computer Engineering: Electives

Course Prerequisites

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

Complementary Studies

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

Computer Engineering, B.A.Sc. (Class of 2024)

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

1. Satisfy the minimum Accreditation Units (AU) set by ECE in each CEAB category.
2. Have at least 5 four-hundred level elective courses.
3. Have at least 3 courses from Electives Lists A, B and C that satisfy the Department criteria for qualified accreditation units in the categories of engineering science and engineering design.
4. Have at least 3 courses from Elective List B.
5. Counting required core courses and elective courses in all four years, result in a total of no fewer than 157.5 credits for the complete program.

Available combinations of elective courses are subject to timetabling constraints.
Second Year CORE 2021-2022

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- 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
- ELEC 274 Computer Architecture W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 279 Introduction to Object Oriented Programming W | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
  or
- MTHE 235 NOT OFFERED 2022-2023 - Differential Equations for Electrical and Computer Engineers F | 3.5
- Complementary Studies, List A F | 3

Total Credits: 44.75

Third Year CORE 2022-2023

- CMPE 365 Algorithms I F | 4
- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- ELEC 373 Computer Networks W | 3.5
- ELEC 374 Digital Systems Engineering W | 4.25
- ELEC 377 Operating Systems F | 4
- ELEC 390 Principles of Design and Development W | K3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- CMPE 223 Software Specifications W | 3
  or
- CMPE 320 Fundamentals of Software Development F | 4
- Technical Electives (choose 1) F/W | 3
- Complementary Studies F/W/S | 3

Total Credits: 38.75 or 39.75

Fourth Year CORE 2023-2024
Electives

Computer Engineering: Electives

Course Prerequisites

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

Complementary Studies

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

Computer Engineering, B.A.Sc. (Class of 2025)

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

1. Satisfy the minimum Accreditation Units (AU) set by ECE in each CEAB category.
2. Have at least 5 four-hundred level elective courses.
3. Have at least 3 courses from Electives Lists A, B, and C that satisfy the Department criteria for qualified accreditation units in the categories of engineering science and engineering design.
4. Have at least 3 courses from Elective List B.
5. Counting required core courses and elective courses in all four years, result in a total of no fewer than 157.5 credits for the complete program.

Available combinations of elective courses are subject to timetabling constraints.

Second Year CORE 2022-2023

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- 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
- ELEC 274 Computer Architecture W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 279 Introduction to Object Oriented Programming W | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
  or
- MTHE 237 Differential Equations for Engineering Science F | 3.5
- Complementary Studies, List A F | 3

Total Credits: 41.75

Third Year CORE 2023-2024

- CMPE 365 Algorithms I F | 4
- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- ELEC 373 Computer Networks W | 3.5
- ELEC 374 Digital Systems Engineering W | 4.25
- ELEC 377 Operating Systems F | 4
- ELEC 390 Principles of Design and Development W | K3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- CMPE 223 Software Specifications W | 3
  OR
- CMPE 320 Fundamentals of Software Development F | 4
- Technical Electives (choose 1) F/W | 6
- Complementary Studies F/W/S | 3

Total Credits: 38.75 or 39.75

Fourth Year CORE 2024-2025

- ELEC 498 Computer Engineering Project FW | K7 *
- Technical Electives F/W | 21.1 or 20.1
- Complementary Studies F/W | 3

Minimum Total Credits: 30.1 or 31.1

* with Departmental and instructor support, students may request to substitute APSC 480 Multi-disciplinary Industry for ELEC 498 Computer Engineering Project.
Electives

Computer Engineering: Electives

Course Prerequisites

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

Complementary Studies

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

Computer Engineering, ECEi Stream, B.A.Sc. (Class of 2023)

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

1. Satisfy the minimum Accreditation Units (AU) set by ECE in each CEAB category.
2. Have at least 5 four-hundred level elective courses.
3. Have at least 3 courses from Electives Lists A, B and C that satisfy the Department criteria for qualified accreditation units in the categories of engineering science and engineering design.
4. Have at least 3 courses from Elective List B.
5. Counting required core courses and elective courses in all four years, result in a total of no fewer than 160.5 credits for the complete program.

Available combinations of elective courses are subject to timetabling constraints.

Second Year CORE 2020-2021

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- 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
- ELEC 274 Computer Architecture W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 279 Introduction to Object Oriented Programming W | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
  or
- MTHE 235 NOT OFFERED 2022-2023 - Differential Equations for Electrical and Computer Engineers F | 3.5
Minimum Total Credits: 44.75

Third Year CORE 2021-2022

- CMPE 365 Algorithms I F | 4
- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- ELEC 373 Computer Networks W | 3.5
- ELEC 374 Digital Systems Engineering W | 4.25
- ELEC 377 Operating Systems F | 4
- ELEC 390 Principles of Design and Development W | K3.5
- CMPE 223 Software Specifications W | 3
  or
- CMPE 320 Fundamentals of Software Development F | 4
- COMM 301 Funding New Ventures S | 3
- COMM 302 Launching New Ventures W | 3
- Technical Electives (choose 1) F/W | 3
- Complementary Studies List A F/W/S | 3

Minimum Total Credits: 41.75 or 42.75

Fourth Year CORE 2022-2023

- ELEC 498 Computer Engineering Project FW | K7 *
- COMM 405 New Business Development F | 3
- Technical Electives F/W | 21.1 or 20.1

Minimum Total Credits: 31.1 or 30.1

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

Electives

Computer Engineering: Electives

Course Prerequisites

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

Complementary Studies

ECEi students are required to take a total of four Complementary Studies courses over 2nd, 3rd and 4th year: one elective Complementary Studies course from List A (Humanities and Social Sciences) and the required three courses COMM 301, COMM 302 and COMM 405.

Computer Engineering, ECEi Stream, B.A.Sc. (Class of 2024)

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

1. Satisfy the minimum Accreditation Units (AU) set by ECE in each CEAB category.
2. Have at least 5 four-hundred level elective courses.
3. Have at least 3 courses from Electives Lists A, B and C that satisfy the Department criteria for qualified accreditation units in the categories of engineering science and engineering design.
4. Have at least 3 courses from Elective List B.
5. Counting required core courses and elective courses in all four years, result in a total of no fewer than 160.5 credits for the complete program.

Available combinations of elective courses are subject to timetabling constraints.

Second Year CORE 2021-2022

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- 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
- ELEC 274 Computer Architecture W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 279 Introduction to Object Oriented Programming W | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
  or
- MTHE 235 NOT OFFERED 2022-2023 - Differential Equations for Electrical and Computer Engineers F | 3.5
- COMM 201 Introduction to Business for Entrepreneurs F | 3

Minimum Total Credits: 44.75

Third Year CORE 2022-2023

- CMPE 365 Algorithms I F | 4
- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- ELEC 373 Computer Networks W | 3.5
- ELEC 374 Digital Systems Engineering W | 4.25
- ELEC 377 Operating Systems F | 4
- ELEC 390 Principles of Design and Development W | K3.5
- CMPE 223 Software Specifications W | 3
  OR
- CMPE 320 Fundamentals of Software Development F | 4
- COMM 301 Funding New Ventures F | 3
- COMM 302 Launching New Ventures W | 3
- Technical Electives (choose 1) F/W | 3
- Complementary Studies List A F/W/S | 3

Minimum Total Credits: 41.75 or 42.75

Fourth Year CORE 2023-2024

- ELEC 498 Computer Engineering Project FW | K7 *
- COMM 405 New Business Development F | 3
- Technical Electives F/W | 21.1 or 20.1

Minimum Total Credits: 31.1 or 30.1

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

Electives

Computer Engineering: Electives

Course Prerequisites

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

Complementary Studies
ECEi students are required to take a total of four Complementary Studies courses over 2nd, 3rd and 4th year: one elective Complementary Studies course from List A (Humanities and Social Sciences) and the required three courses COMM 301, COMM 302 and COMM 405.

**Computer Engineering, ECEi Stream, B.A.Sc. (Class of 2025)**

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

1. Satisfy the minimum Accreditation Units (AU) set by ECE in each CEAB category.
2. Have at least 5 four-hundred level elective courses.
3. Have at least 3 courses from Electives Lists A, B and C that satisfy the Department criteria for qualified accreditation units in the categories of engineering science and engineering design.
4. Have at least 3 courses from Elective List B.
5. Counting required core courses and elective courses in all four years, result in a total of no fewer than 160.5 credits for the complete program.

Available combinations of elective courses are subject to timetabling constraints.

**Second Year CORE 2022-2023**

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- 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
- ELEC 274 Computer Architecture W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 279 Introduction to Object Oriented Programming W | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
  or
- MTHE 237 Differential Equations for Engineering Science F | 3.5
- COMM 201 Introduction to Business for Entrepreneurs F | 3

**Minimum Total Credits: 44.75**

**Third Year CORE 2023-2024**

- CMPE 365 Algorithms I F | 4
- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- ELEC 373 Computer Networks W | 3.5
- ELEC 374 Digital Systems Engineering W | 4.25
- ELEC 377 Operating Systems F | 4
- ELEC 390 Principles of Design and Development W | K3.5
- CMPE 223 Software Specifications W | 3
  OR
• CMPE 320 Fundamentals of Software Development F | 4
• COMM 301 Funding New Ventures F | 3
• COMM 302 Launching New Ventures W | 3
• Technical Electives (choose 1) F/W | 3
• Complementary Studies List A F/W/S | 3

Minimum Total Credits: 41.75 or 42.75

Fourth Year CORE 2024-2025

• ELEC 498 Computer Engineering Project FW | K7 *
• COMM 405 New Business Development F | 3
• Technical Electives F/W | 21.1 or 20.1

Minimum Total Credits: 31.1 or 30.1

• with Departmental and instructor support, students may request to substitute APSC 480 Multi-disciplinary Industry for ELEC 498 Computer Engineering Project.

Electives

Computer Engineering: Electives

Course Prerequisites

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

Complementary Studies

ECEi students are required to take a total of four Complementary Studies courses over 2nd, 3rd and 4th year: one elective Complementary Studies course from List A (Humanities and Social Sciences) and the required three courses COMM 301, COMM 302, COMM 405.

Computer Engineering: Electives

Electives List A

• ELEC 224 Continuous-Time Signals and Systems W | 3.75
• ELEC 324 Discrete-Time Signals and Systems F | 4
- ELEC 344 Sensors and Actuators F | 3.75
- ELEC 353 Electronics II F | 4.25
- ELEC 372 Numerical Methods and Optimization W | 3.5
- ELEC 408 NOT OFFERED 2022-2023 Biomedical Signal and Image Processing W | 3
- ELEC 409 NOT OFFERED 2022-2023 Bioinformatic Analytics F | 3
- ELEC 421 NOT OFFERED 2022-2023 Digital Signal Processing: Filters and System Design F | 4
- ELEC 425 Machine Learning and Deep Learning F | 3.5
- ELEC 431 Power Electronics F | 3.25
- ELEC 443 Linear Control Systems F | 4.25
- ELEC 444 NOT OFFERED 2022-2023 Modeling and Computer Control of Mechatronic Systems W | 3.25
- ELEC 448 Introduction to Robotics: Mechanics and Control F | 3.5
  or
- MECH 456 Introduction to Robotics F | 3.5
- ELEC 461 NOT OFFERED 2022-2023 Digital Communications F | 3.5
- ELEC 464 Wireless Communications W | 3
- ELEC 470 Computer System Architecture W | 3.5
- ELEC 472 Artificial Intelligence W | 3.5
- ELEC 473 Cryptography and Network Security F | 3
- ELEC 474 NOT OFFERED 2022-2023 Machine Vision F | 3.5
- ELEC 497 Research Project FW/S | K3.5
- SOFT 423 Software Requirements W | 3
- SOFT 437 Performance Analysis F | 3

Electives List B

- CMPE 204 Logic for Computing Science F/W | K3
- CMPE 251 Data Analytics F | K3
- CMPE 320 Fundamentals of Software Development F | 4
- CMPE 322 Software Architecture W | K4
- CMPE 325 Human-Computer Interaction W | 3
- CMPE 327 Software Quality Assurance F | 3
- CMPE 332 Database Management Systems W | 3
- CMPE 351 Advanced Data Analytics W | 3
- CMPE 422 Formal Methods in Software Engineering F | 3
- CMPE 425 NOT OFFERED 2022-2023 Advanced User Interface Design W | 3
- CMPE 432 NOT OFFERED 2022-2023 Advanced Database Systems F | 3
- CMPE 434 NOT OFFERED 2022-2023 Distributed Systems F | 3
- CMPE 452 Neural Networks and Genetic Algorithms F | 3
- CMPE 454 Computer Graphics W | 3
- CMPE 457 Image Processing and Computer Vision W | 3
- CMPE 458 Programming Language Processors W | 4
- ENPH 336 Solid State Devices W | 3.25

Electives List C
Electrical Engineering

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

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

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

Electrical Engineering, B.A.Sc. (Class of 2023)

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

1. Satisfy 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. Counting required core courses and elective courses in all four years, result in a total of no fewer than 157.5 credits for the complete program.

Available combinations of elective courses are subject to timetabling constraints.

Second Year CORE 2020-2021

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- ELEC 221 Electric Circuits F | 4.25
- ELEC 224 Continuous-Time Signals and Systems W | 3.75
- ELEC 252 Electronics I W | 4.25
- ELEC 271 Digital Systems F | 4
• ELEC 274 Computer Architecture W | 4
• ELEC 278 Fundamentals of Information Structures F | 4
• ELEC 280 Fundamentals of Electromagnetics W | 3.75
• ELEC 299 Mechatronics Project W | K1.5
• MTHE 228 Complex Analysis W | 3.5
• MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
  or
• MTHE 235 NOT OFFERED 2022-2023 - Differential Equations for Electrical and Computer Engineers F | 3.5
• Complementary Studies, List A F/W/S | 3

Minimum Total Credits: 44.5

Third Year CORE 2021-2022

• ELEC 324 Discrete-Time Signals and Systems F | 4
• ELEC 326 Probability and Random Processes F | 3.5
• ELEC 353 Electronics II F | 4.25
• ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
• ELEC 372 Numerical Methods and Optimization W | 3.5
• ELEC 381 Applications of Electromagnetics W | 3.75
• ELEC 390 Principles of Design and Development W | K3.5
• ENPH 336 Solid State Devices W | 3.25
• APSC 221 Economics and Business Practices in Engineering F/W/S | 3
• Technical Electives (choose 1) F/W | 3
• Complementary Studies F/W/S | 3

Minimum Total Credits: 38.75

Fourth Year CORE 2022-2023

• ELEC 490 Electrical Engineering Project FW | K7 *
• Technical Electives F/W | 21.35
• Complementary Studies F/W/S | 3

Total Credits: 31.35

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

Electives

Electrical Engineering: Electives

Course Prerequisites

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

Complementary Studies

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

Electrical Engineering, B.A.Sc. (Class of 2024)

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

1. Satisfy 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. Counting required core courses and elective courses in all four years, result in a total of no fewer than 157.5 credits for the complete program.

Available combinations of elective courses are subject to timetabling constraints.

Second Year CORE 2021-2022

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- ELEC 221 Electric Circuits F | 4.25
- ELEC 224 Continuous-Time Signals and Systems W | 3.75
- ELEC 252 Electronics I W | 4.25
- ELEC 271 Digital Systems F | 4
- ELEC 274 Computer Architecture W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 228 Complex Analysis W | 3.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
  or
- MTHE 235 NOT OFFERED 2022-2023 - Differential Equations for Electrical and Computer Engineers F | 3.5
- Complementary Studies F/W/S | 3

Minimum Total Credits: 44.5

Third Year CORE 2022-2023

- ELEC 324 Discrete-Time Signals and Systems F | 4
- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 353 Electronics II F | 4.25
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
• ELEC 372 Numerical Methods and Optimization W | 3.5
• ELEC 381 Applications of Electromagnetics W | 3.75
• ELEC 390 Principles of Design and Development W | K3.5
• ENPH 336 Solid State Devices W | 3.25
• APSC 221 Economics and Business Practices in Engineering F/W/S | 3
• Technical Electives (choose 1) F/W | 3
• Complementary Studies F/W/S | 3

Minimum Total Credits: 38.75

Fourth Year CORE 2023-2024

• ELEC 490 Electrical Engineering Project FW | K7 *
• Technical Electives F/W | 21.35
• Complementary Studies F/W | 3

Total Credits: 31.35

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

Electives

Electrical Engineering: Electives

Course Prerequisites

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

Complementary Studies

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

Electrical Engineering, B.A.Sc. (Class of 2025)

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

1. Satisfy 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. Counting required core courses and elective courses in all four years, result in a total of no fewer than 157.5 credits for the complete program. Available combinations of elective courses are subject to timetabling constraints.

Second Year CORE 2022-2023

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- ELEC 221 Electric Circuits F | 4.25
- ELEC 224 Continuous-Time Signals and Systems W | 3.75
- ELEC 252 Electronics I W | 4.25
- ELEC 271 Digital Systems F | 4
- ELEC 274 Computer Architecture W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 228 Complex Analysis W | 3.5
- or
- MTHE 237 Differential Equations for Engineering Science F | 3.5
- Complementary Studies, List A F/W/S | 3

Minimum Total Credits: 44.5

Third Year CORE 2023-2024

- ELEC 324 Discrete-Time Signals and Systems F | 4
- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 353 Electronics II F | 4.25
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- ELEC 372 Numerical Methods and Optimization W | 3.5
- ELEC 381 Applications of Electromagnetics W | 3.75
- ELEC 390 Principles of Design and Development W | K3.5
- ENPH 336 Solid State Devices W | 3.25
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- Technical Electives (choose 1) F/W | 3
- Complementary Studies F/W/S | 3

Minimum Total Credits: 38.75

Fourth Year CORE 2024-2025

- ELEC 490 Electrical Engineering Project FW | K7 *
Electives

Electrical Engineering: Electives

Course Prerequisites

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

Complementary Studies

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

Electrical Engineering, ECEi Stream, B.A.Sc. (Class of 2023)

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

1) Satisfy 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) Counting required core courses and elective courses in all four years, result in a total of no fewer than 160.5 credits for the complete program.

Available combinations of elective courses are subject to timetabling constraints.

Second Year CORE 2020-2021

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- ELEC 221 Electric Circuits F | 4.25
- ELEC 224 Continuous-Time Signals and Systems W | 3.75
- ELEC 252 Electronics I W | 4.25
- ELEC 271 Digital Systems F | 4
- ELEC 274 Computer Architecture W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75

Total Credits: 31.35

* with Departmental and instructor support, students may request to substitute APSC 480 for ELEC 490.
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 228 Complex Analysis W | 3.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
  or
- MTHE 235 NOT OFFERED 2022-2023 - Differential Equations for Electrical and Computer Engineers F | 3.5
- COMM 201 Introduction to Business for Entrepreneurs F | 3

Minimum Total Credits: 44.5

Third Year CORE 2021-2022

- ELEC 324 Discrete-Time Signals and Systems F | 4
- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 353 Electronics II F | 4.25
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- ELEC 372 Numerical Methods and Optimization W | 3.5
- ELEC 381 Applications of Electromagnetics W | 3.75
- ELEC 390 Principles of Design and Development W | K3.5
- ENPH 336 Solid State Devices W | 3.25
- COMM 301 Funding New Ventures S | 3
- COMM 302 Launching New Ventures W | 3
- Technical Electives (choose 1) F/W | 3
- Complementary Studies List A F/W/S | 3

Minimum Total Credits: 41.75

Fourth Year CORE 2022-2023

- ELEC 490 Electrical Engineering Project FW | K7 *
- COMM 405 New Business Development F | 3
- Technical Electives F/W | 21.35

Minimum Total Credits: 31.35

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

Electives

Electrical Engineering: Electives

Course Prerequisites

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

Complementary Studies

ECEi students are required to take a total of four Complementary Studies courses over 2nd, 3rd and 4th year: one elective Complementary Studies course from List A (Humanities and Social Sciences) and the required three courses COMM 301, COMM 302, and COMM 405.

Electrical Engineering, ECEi Stream, B.A.Sc. (Class of 2024)

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

1) Satisfy 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) Counting required core courses and elective courses in all four years, result in a total of no fewer than 160.5 credits for the complete program.

Available combinations of elective courses are subject to timetabling constraints.

Second Year CORE 2021-2022

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- ELEC 221 Electric Circuits F | 4.25
- ELEC 224 Continuous-Time Signals and Systems W | 3.75
- ELEC 252 Electronics I W | 4.25
- ELEC 271 Digital Systems F | 4
- ELEC 274 Computer Architecture W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 228 Complex Analysis W | 3.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
  or
- MTHE 235 NOT OFFERED 2022-2023 - Differential Equations for Electrical and Computer Engineers F | 3.5
- COMM 201 Introduction to Business for Entrepreneurs F | 3

Minimum Total Credits: 44.5

Third Year CORE 2022-2023

- ELEC 324 Discrete-Time Signals and Systems F | 4
- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 353 Electronics II F | 4.25
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- ELEC 372 Numerical Methods and Optimization W | 3.5
- ELEC 381 Applications of Electromagnetics W | 3.75
- ELEC 390 Principles of Design and Development W | K3.5
- ENPH 336 Solid State Devices W | 3.25
- COMM 301 Funding New Ventures F | 3
- COMM 302 Launching New Ventures W | 3
- Technical Electives (choose 1) F/W | 3
- Complementary Studies List A F/W/S | 3

Minimum Total Credits: 41.75

Fourth Year CORE 2023-2024

- ELEC 490 Electrical Engineering Project FW | K7 *
- COMM 405 New Business Development F | 3
- Technical Electives F/W | 21.35

Minimum Total Credits: 31.35

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

Electives

Electrical Engineering: Electives

Course Prerequisites

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

Complementary Studies

ECEi students are required to take a total of four Complementary Studies courses over 2nd, 3rd and 4th year: one elective Complementary Studies course from List A (Humanities and Social Sciences) and the required three courses COMM 301, COMM 302, and COMM 405.

Electrical Engineering, ECEi Stream, B.A.Sc. (Class of 2025)

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

1) Satisfy 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) Counting required core courses and elective courses in all four years, result in a total of no fewer than 160.5 credits for the complete program.

Available combinations of elective courses are subject to timetabling constraints.

**Second Year CORE 2022-2023**

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- ELEC 221 Electric Circuits F | 4.25
- ELEC 224 Continuous-Time Signals and Systems W | 3.75
- ELEC 252 Electronics I W | 4.25
- ELEC 271 Digital Systems F | 4
- ELEC 274 Computer Architecture W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 228 Complex Analysis W | 3.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
  or
- MTHE 237 Differential Equations for Engineering Science F | 3.5
- COMM 201 Introduction to Business for Entrepreneurs F | 3

**Minimum Total Credits: 44.5**

**Third Year CORE 2023-2024**

- ELEC 324 Discrete-Time Signals and Systems F | 4
- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 353 Electronics II F | 4.25
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- ELEC 372 Numerical Methods and Optimization W | 3.5
- ELEC 381 Applications of Electromagnetics W | 3.75
- ELEC 390 Principles of Design and Development W | K3.5
- ENPH 336 Solid State Devices W | 3.25
- COMM 301 Funding New Ventures S | 3
- COMM 302 Launching New Ventures W | 3
- Technical Electives (choose 1) F/W | 3
- Complementary Studies List A F/W | 3

**Minimum Total Credits: 41.75**
Fourth Year CORE 2024-2025

- ELEC 490 Electrical Engineering Project FW | K7 *
- COMM 405 New Business Development F| 3
- Technical Electives F/W | 21.35

Minimum Total Credits: 31.35

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

Electives

Electrical Engineering: Electives

Course Prerequisites

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

Complementary Studies

ECEi students are required to take a total of four Complementary Studies courses over 2nd, 3rd and 4th year: one elective Complementary Studies course from List A (Humanities and Social Sciences) and the required three courses COMM 301, COMM 302, and COMM 405.
Electrical Engineering: Electives

Electives List A

- ELEC 270 Discrete Mathematics with Computer Engineering Applications W | 3.5
- ELEC 279 Introduction to Object Oriented Programming W | 4
- ELEC 333 Electric Machines W | 4.25
- ELEC 344 Sensors and Actuators F | 3.75
- ELEC 373 Computer Networks W | 3.5
- ELEC 374 Digital Systems Engineering W | 4.25
- ELEC 408 NOT OFFERED 2022-2023 Biomedical Signal and Image Processing W | 3
- ELEC 409 NOT OFFERED 2022-2023 Bioinformatic Analytics F | 3
- ELEC 421 NOT OFFERED 2022-2023 Digital Signal Processing: Filters and System Design F | 4
- ELEC 425 Machine Learning and Deep Learning F | 3.5
- ELEC 431 Power Electronics F | 3.25
- ELEC 433 Energy and Power Systems W | 3.5
- ELEC 436 NOT OFFERED 2022-2023 Electric Machines and Control W | 3
- ELEC 443 Linear Control Systems F | 4.25
- ELEC 444 NOT OFFERED 2022-2023 Modeling and Computer Control of Mechatronic Systems W | 3.25
- ELEC 448 Introduction to Robotics: Mechanics and Control F | 3.5
  or
- MECH 456 Introduction to Robotics F | 3.5
- ELEC 454 NOT OFFERED 2022-2023 Analog Electronics W | 3.25
- ELEC 457 Integrated Circuits and System Applications F | 3.25
- ELEC 461 NOT OFFERED 2022-2023 Digital Communications F | 3.5
- ELEC 464 Wireless Communications W | 3
- ELEC 470 Computer System Architecture W | 3.5
- ELEC 472 Artificial Intelligence W | 3.5
- ELEC 473 Cryptography and Network Security F | 3
- ELEC 474 NOT OFFERED 2022-2023 Machine Vision F | 3.5
- ELEC 481 Applications of Photonics F | 3
- ELEC 483 Microwave and RF Circuits and Systems W | 4.25
- ELEC 486 NOT OFFERED 2022-2023 Fiber Optic Communications F | 3.75
- ELEC 497 Research Project FW/S | K3.5

Electives List B
- APSC 303 Professional Internship | 3.5
- APSC 400 NOT OFFERED 2022-2023 Technology, Engineering & Management (TEAM) FW* | K7
- APSC 401 Interdisciplinary Projects W | K4.5
- CHEE 340 Biomedical Engineering W | 3.5
- ENPH 460 Laser Optics W | 3.5
- CMPE 3XX Any Third Year Computing Science Course | 3
- CMPE 4XX Any Fourth Year Computing Science Course | 3
- MTHE 337 Introduction to Operations Research Models W | 3
- MTHE 367 NOT OFFERED 2022-2023 - Engineering Data Analysis W | 3.5
- MTHE 430 Control Theory F | 4
- MTHE 455 Stochastic Processes and Applications F | 3.5
- MTHE 472 Optimization and Control of Stochastic Systems W | 3.5
- MTHE 474 Information Theory F | 3.5
- MTHE 477 Data Compression and Source Coding: Theory and Algorithms W | 3
- MTHE 478 NOT OFFERED 2022-2023 - Topics in Communication Theory F/W | 3
- MECH 228 Kinematics and Dynamics F/W | K3.5
- MECH 328 Dynamics and Vibration F | 3.5
- MECH 393 Biomechanical Product Development W | 3.5
- MECH 423 Introduction to Microsystems W | 3.5
- MECH 455 Computer Integrated Manufacturing F | 3.5
- MECH 465 Computer-Aided Design F | 3.5
- MECH 478 Biomaterials F | 3.5
- MECH 494 Kinematics of Human Motion W | 3.5
- MINE 472 Not Offered 2021-2022 Mining Systems, Automation, and Robotics O/L | K3.5

Engineering Chemistry

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

Ancillary Fees

Chemical Engineering and Engineering Chemistry students may be required to pay ancillary fees for course related learning materials, safety equipment and field trips.
Engineering Chemistry, B.A.Sc. (Class of 2023)

Second Year CORE 2020-2021

- CHEE 209 Analysis of Process Data F | 3.5
- CHEE 221 Chemical Processes and Systems F | 3.5
- CHEE 270 ChemEtronics F | K3
- ENCH 211 Main Group Chemistry F | 4.75
- ENCH 212 Principles of Chemical Reactivity F | 4
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- CHEE 210 Thermodynamics of Energy Conversion Systems W | 3.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 222 Methods of Structure Determination W | 3.75
- ENCH 245 Applied Organic Chemistry I W | 4.75

Minimum Total Credits: 46.25

Third Year CORE 2021-2022

- 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 380 Biochemical Engineering F | 3.5
- ENCH 213 Introduction to Chemical Analysis F | 4.75
- ENCH 312 Transition Metal Chemistry F | 3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- CHEE 331 Design of Unit Operations W | K4.5
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- CHEE 363 Electrochemical Engineering* W | 3.5
- ENCH 399 Experimental Chemistry II W | 3.5
- Electives (minimum 6 credits) F/W | 6

Minimum Credits: 43.75

Fourth Year CORE 2022-2023

- CHEE 460 Applied Surface and Colloid Science F | 3.5
- ENCH 313 Quantum Mechanics F | 3.5
- CHEE 324 NOT OFFERED 2022-2023 Organic Process Development W | 3.5
- CHEE 471 Chemical Process Design FW | K7
Minimum Total Credits: 46

Technical Electives:

Students in the ENCH program are required to take two (2) technical elective courses from the approved Group A list (any combination from Materials, Environment, Biosciences, and General lists), and one (1) technical elective course from the approved Group B list.

Engineering Chemistry: Technical Electives

Complementary Studies:

Students choose a total of 9 credits from the approved Lists A or B, of which 3 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 APSC 221 (this is a CORE course).

Communications:

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

Engineering Chemistry, B.A.Sc. (Class of 2024)

Second Year CORE 2021-2022

- CHEE 209 Analysis of Process Data F | 3.5
- CHEE 221 Chemical Processes and Systems F | 3.5
- CHEE 270 ChemEtronics F | K3
- ENCH 211 Main Group Chemistry F | 4.75
- ENCH 212 Principles of Chemical Reactivity F | 4
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- CHEE 210 Thermodynamics of Energy Conversion Systems W | 3.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 222 Methods of Structure Determination W | 3.75
- ENCH 245 Applied Organic Chemistry I W | 4.75
Minimum Total Credits: 46.25

Third Year CORE 2022-2023

- 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 380 Biochemical Engineering F | 3.5
- ENCH 213 Introduction to Chemical Analysis F | 4.75
- ENCH 312 Transition Metal Chemistry F | 3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- CHEE 331 Design of Unit Operations W | K4.5
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- CHEE 363 Electrochemical Engineering* W | 3.5
- ENCH 399 Experimental Chemistry II W | 3.5
    Electives (minimum 6 credits) F/W | 6

Minimum Credits: 43.75

Fourth Year CORE 2023-2024

- CHEE 460 Applied Surface and Colloid Science F | 3.5
- ENCH 313 Quantum Mechanics F | 3.5
- CHEE 471 Chemical Process Design FW | K7
- ENCH 417 Research Project FW | 9
- CHEE 324 NOT OFFERED 2022-2023 Organic Process Development W | 3.5
- CHEE 415 Engineering Chemistry Laboratory W | 4
- CHEE 463 Electrochemical Energy Systems W | 3.5
    Electives (minimum 12 credits) F/W | 12

Minimum Total Credits: 46

Technical Electives:

Students in the ENCH program are required to take two (2) courses from the approved Group A list (any combination from Materials, Environment, Biosciences, and General lists), and one (1) course from the approved Group B list.

Engineering Chemistry: Technical Electives

Complementary Studies:

Students choose a total of 9 credits from the approved Lists A or B, of which 3 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 APSC 221.

Communications:

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

Engineering Chemistry, B.A.Sc. (Class of 2025)

Second Year CORE 2022-2023

- CHEE 209 Analysis of Process Data F | 3.5
- CHEE 221 Chemical Processes and Systems F | 3.5
- CHEE 270 ChemEtronics F | K3
- ENCH 211 Main Group Chemistry F | 4.75
- ENCH 212 Principles of Chemical Reactivity F | 4
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- CHEE 210 Thermodynamics of Energy Conversion Systems W | 3.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 222 Methods of Structure Determination W | 3.75
- ENCH 245 Applied Organic Chemistry I W | 4.75

Minimum Total Credits: 46.25

Third Year CORE 2023-2024

- 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 380 Biochemical Engineering F | 3.5
- ENCH 213 Introduction to Chemical Analysis F | 4.75
- ENCH 312 Transition Metal Chemistry F | 3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- CHEE 324 NOT OFFERED 2022-2023 Organic Process Development W | 3.5
- CHEE 331 Design of Unit Operations W | K4.5
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- CHEE 363 Electrochemical Engineering* W | 3.5
- ENCH 399 Experimental Chemistry II W | 3.5
- ELECTIVES (minimum 3 credits) F/W | 3

Minimum Total Credits: 44.25

Fourth Year CORE 2024-2025
- CHEE 460 Applied Surface and Colloid Science F | 3.5
- ENCH 313 Quantum Mechanics F | 3.5
- CHEE 471 Chemical Process Design FW | K7
- ENCH 417 Research Project FW | 9
- CHEE 415 Engineering Chemistry Laboratory W | 4
- CHEE 463 Electrochemical Energy Systems W | 3.5
- Electives (minimum 15 credits) F/W | 15

Minimum Total Credits: 45.5

Technical Electives:

Students in the ENCH program are required to take two (2) courses from the approved Group A list (any combination from Materials, Environment, Biosciences, and General lists), and one (1) course from the approved Group B list.

Engineering Chemistry: Technical Electives

Engineering Economics:

To meet the engineering economics requirement, students take APSC 221.

Communications:

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

Complementary Studies:

Students choose a total of 9 credits from the approved Lists A or B, of which 3 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 Chemistry: Technical Electives

TECHNICAL ELECTIVES

PLEASE 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 this upcoming year.

GROUP A TECHNICAL ELECTIVES

Biomedical
• CHEE 340 Biomedical Engineering W | 3.5
• CHEE 440 Pharmaceutical Technology W | 3.5
• MECH 393 Biomechanical Product Development W | 3.5
• MECH 492 Biological Fluid Dynamics F | 3.5

Energy, Energy Resources, and Petroleum Engineering

• CHEE 414 Foundations of the Oil and Gas Industry W | K3.5
• MECH 435 Internal Combustion Engines W | 3.5
• MECH 437 NOT OFFERED 2022-2023 - Fuel Cell Technology F | 3.5
• MECH 439 NOT OFFERED 2022-2023 Turbomachinery W | 3.5

Environmental

• CHEE 342 Environmental Biotechnology F | 3.5
• CHEE 371 Mitigation of Industrial Pollution W | 3.5
• CHEE 484 NOT OFFERED 2022-2023 Bioremediation W | 3.5
• CIVL 371 Groundwater Engineering F | 3.75
• CIVL 372 Water and Wastewater Engineering W | 4
• CIVL 451 Lake, Reservoir and Coastal Engineering F | 3.75
• CIVL 471 Subsurface Contamination F | 4

Materials Processing

• CHEE 323 Industrial Catalysis W | 3.5
• CHEE 490 NOT OFFERED 2022-2023 Polymer Formulations and Processing Technology W | 3.5

Minerals Processing

• MINE 331 Methods of Mineral Separation F | 4.5
• MINE 335 Mineral Processing F | 3
• MINE 451 Chemical Extraction of Metals F | 4
• MNTC 306 Mineral Processing Unit Operations O/L | 3
• MNTC 311 Ore Body Modelling and Resource Estimation O/L | 4.5
• MNTC 415 Metal Extraction Processes O/L | 4

General

• APSC 303 Professional Internship | 3.5
• APSC 381 Advanced Design and Skills for Innovation W | K3.5
• APSC 401 Interdisciplinary Projects W | K4.5
• CHEE 319 Process Dynamics and Control W | 3.5
• CHEE 410 Engineering Innovation and Entrepreneurship W | K3.5
• CHEE 412 Transport Phenomena W | 3.5
• CHEE 418 Strategies for Process Investigations F | 3.5
• CHEE 434 NOT OFFERED 2022-2023 Process Control II W | 3.5
• MECH 430 NOT OFFERED 2022-2023 - Thermal Systems Design W | 4
• MECH 480 Airplane Aerodynamics and Performance W | 3.5

NOTE: APSC 303 will count as a Group A Technical Elective upon successful completion of internship.

GROUP B TECHNICAL ELECTIVES

All CHEM/ENCH courses numbered from 311 to 489, excluding those courses already required in the core of the program, can be considered as a Group B TECH course.

• ENCH 311 Mechanistic Organic 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 411 Advanced Analytical Chemistry F | 3
• ENCH 412 NOT OFFERED 2022-2023 - Statistical Mechanics W | 3
• ENCH 413 Computational Chemistry F | 3
• ENCH 414 Catalysis F | 3
• ENCH 421 Advanced Methods in Physical Chemistry W | 3
• ENCH 422 Not Offered 2022-2023 Synthetic Organic Chemistry W | 3.5
• ENCH 423 Topics in Inorganic and Organometallic Chemistry W | 3
• ENCH 424 Polymer Chemistry W | 3
• ENCH 425 NOT OFFERED 2022-2023 - Self-Assembly and Materials W | 3

Engineering Physics

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

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

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

Options available:

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

**Engineering Physics, B.A.Sc. (Class of 2023)**

**Second Year CORE - 2020-2021**

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

**Electrical Sub-Plan (P1)**

- ELEC 252 Electronics I W | 4.25
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 224 Continuous-Time Signals and Systems W | 3.75

Minimum Units: 46.75

**Materials Sub-Plan (P3)**

- MECH 241 Fluid Mechanics I W | 3.5
- MECH 270 Materials Science and Engineering F | 3.5
- ENPH 225 Mechanics W | 3.5

Minimum Units: 45.25

**Mechanical Sub-Plan (P4)**

- MECH 230 Applied Thermodynamics I F | 3.5
- MECH 241 Fluid Mechanics I W | 3.5
- ENPH 225 Mechanics W | 3.5

Minimum Units: 45.25

**Computing Sub-Plan (P6)**
• CMPE 212 Introduction to Computing Science II F/W | 4
• ELEC 278 Fundamentals of Information Structures F | 4
• ENPH 225 Mechanics W | 3.5

Minimum Units: 46.25

Third Year CORE - 2021-2022

• APSC 221 Economics and Business Practices in Engineering F/W/S | 3
• ENPH 344 Introduction to Quantum Mechanics F | 3.5
• ENPH 345 Quantum Physics of Atoms, Nuclei and Particles W | 3.5
• ENPH 353 Engineering Physics Experiment Design F | 2.5
• ENPH 354 Engineering Physics Design Project W | 3.5
• ENPH 316 Mathematical Methods in Physics I F | 3.5

Notes:

* ENPH 317 can be taken in 3rd or 4th year and is a Physics List A elective.

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

APSC 303 may be taken as a List B technical elective for students that have successfully completed the internship program (QUIP).

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

Physics list A electives ENPH 491 and ENPH 495 typically are not offered every year, thus students may want to consider adding them to their third year program.

Note: In the third year of the Engineering Physics program students may apply to the Accelerated Masters program. In this program, students work closely with a supervisor in the summer after the third year of school doing research that leads towards a Masters degree in Physics or Engineering Physics. To accelerate students' progress towards a Masters degree, students take two graduate courses in their fourth year. These courses replace the Engineering Elective and a List "A" or List "B" course in the undergraduate program. Students enroll in ENPH 555 for their undergraduate thesis instead of ENPH 455. Students are admitted based on a minimum GPA of 3.7 and acceptance by a supervisor. Students are expected to finish their full Masters degree within 16 months after the undergraduate program, saving a year of time. For details see http://queensu.ca/physics/undergrad-studies/accelerated-msc-masc

Electrical Sub-Plan (P1)

• ELEC 353 Electronics II F | 4.25
• ENPH 336 Solid State Devices W | 3.25
• ENPH 372 Thermodynamics W | 3.5
• ELEC 324 Discrete-Time Signals and Systems F | 4
• ENPH 225 Mechanics W | 3.5

Minimum Units: 41.75

Materials Sub-Plan (P3)
- ENPH 334 Electronics for Applied Scientists F | 5
- ENPH 372 Thermodynamics W | 3.5
- MECH 370 Principles of Materials Processing F | 3.5
- MECH 371 Fracture Mechanics and Dislocation Theory W | 3.5
- MECH 396 Mechanical and Materials Engineering Laboratory I F | K2
- MECH 397 Mechanical and Materials Engineering Laboratory II W | K2

Minimum Units: 39

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

Minimum Units: 38.5

Computing Sub-Plan (P6)

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

Fourth Year CORE - 2022-2023

- ENPH 431 Electromagnetic Theory F | 3.5
- 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
- Engineering Elective (any 200-, 300- or 400-level Engineering and Applied Science course) F/W | 3

Note:

* Students may take ENPH 555 as an alternative to ENPH 455. See the Notes regarding the Accelerated Masters program after the 3rd year program listing.

** 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.

One from Physics List A:

Physics List A:
• ENPH 317 Mathematical Methods in Physics II W | 3.5
• ENPH 321 Advanced Mechanics F | 3.5
• ENPH 414 Introduction to General Relativity W | 3
• ENPH 460 Laser Optics W | 3.5
• ENPH 472 Statistical Mechanics F | 3.5
• ENPH 479 High Performance Computing in Engineering Physics W | 3
• ENPH 480 Solid State Physics F | 3.5
• ENPH 483 NOT OFFERED 2022-2023 - Nanoscience and Nanotechnology W | 3.5
• ENPH 490 Nuclear Physics F | 3.5
• ENPH 491 NOT OFFERED 2022-2023 - Physics of Nuclear Reactors F | 3.5
• ENPH 495 Introduction to Medical Physics W | 3

Electrical Sub-Plan (P1)

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

Electrical List B:

• ELEC 326 Probability and Random Processes F | 3.5
• ELEC 333 Electric Machines W | 4.25
• ELEC 344 Sensors and Actuators F | 3.75
• ELEC 373 Computer Networks W | 3.5
• ELEC 408 NOT OFFERED 2022-2023 Biomedical Signal and Image Processing W | 3
• ELEC 409 NOT OFFERED 2022-2023 Bioinformatic Analytics F | 3
• ELEC 421 NOT OFFERED 2022-2023 Digital Signal Processing: Filters and System Design F | 4
• ELEC 422 NOT OFFERED 2022-2023 Digital Signal Processing: Random Models and Applications F | 3.5
• ELEC 431 Power Electronics F | 3.25
• ELEC 443 Linear Control Systems F | 4.25
• ELEC 448 Introduction to Robotics: Mechanics and Control F | 3.5
• ELEC 451 NOT OFFERED 2022-2023 Digital Integrated Circuit Engineering F | 3.25
• ELEC 454 NOT OFFERED 2022-2023 Analog Electronics W | 3.25
• ELEC 457 Integrated Circuits and System Applications F | 3.25
• ELEC 461 NOT OFFERED 2022-2023 Digital Communications F | 3.5
• ELEC 464 Wireless Communications W | 3
• ELEC 483 Microwave and RF Circuits and Systems W | 4.25
• ELEC 486 NOT OFFERED 2022-2023 Fiber Optic Communications F | 3.75
• CHEE 340 Biomedical Engineering W | 3.5

Note:

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

Minimum Units: 36.5

Materials Sub-Plan (P3)
• ENPH 480 Solid State Physics F | 3.5

Materials List B:

Two courses from Materials List B*:

• MECH 423 Introduction to Microsystems W | 3.5
• MECH 437 NOT OFFERED 2022-2023 - Fuel Cell Technology 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 Nano-Structured Materials F | 3.5
• MECH 483 Nuclear Materials F | 3.5
• MECH 484 DELETED - 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.

Minimum Units: 38

Mechanical Sub-Plan (P4)

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

Mechanical List B:

• CHEE 340 Biomedical Engineering W | 3.5
• MECH 420 NOT OFFERED 2022-2023 - Vibrations W | 3.5
• MECH 423 Introduction to Microsystems W | 3.5
• MECH 424 NOT OFFERED 2022-2023 - Sustainable Product Design F | 3.5
• MECH 430 NOT OFFERED 2022-2023 - Thermal Systems Design W | 4
• MECH 435 Internal Combustion Engines W | 3.5
• MECH 437 NOT OFFERED 2022-2023 - Fuel Cell Technology F | 3.5
• MECH 439 NOT OFFERED 2022-2023 Turbomachinery W | 3.5
• MECH 441 NOT OFFERED 2022-2023 - Fluid Mechanics III W | 3.5
• MECH 444 Computational Fluid Dynamics F | 3.5
• MECH 448 Compressible Fluid Flow W | 3.5
• MECH 452 NOT OFFERED 2022-2023 - Mechatronics Engineering W | 5
• MECH 456 Introduction to Robotics F | 3.5
• MECH 465 Computer-Aided Design F | 3.5
• MECH 480 Airplane Aerodynamics and Performance W | 3.5
• MECH 481 NOT OFFERED 2022-2023 Wind Energy F | 3.5
• MECH 482 NOT OFFERED 2022-2023 - Noise Control W | 3.5
• MECH 492 Biological Fluid Dynamics F | 3.5
• MECH 495 Ergonomics and Design F | 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.

Minimum Units: 37.5

Computing Sub-Plan (P6)

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

Computing List B:

- CHEE 340 Biomedical Engineering W | 3.5
- CMPE 330 Computer-Integrated Surgery F | 3
- CMPE 365 Algorithms I F | 4
- CMPE 452 Neural Networks and Genetic Algorithms F | 3
- CMPE 454 Computer Graphics W | 3
- CMPE 457 Image Processing and Computer Vision W | 3
- CMPE 458 Programming Language Processors W | 4
- CMPE 472 Medical Informatics W | 3
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- ELEC 374 Digital Systems Engineering W | 4.25
- ELEC 377 Operating Systems F | 4
- ELEC 408 NOT OFFERED 2022-2023 Biomedical Signal and Image Processing W | 3
- ELEC 409 NOT OFFERED 2022-2023 Bioinformatic Analytics F | 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.

Minimum Units: 37.5

Complementary Studies:

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

Engineering Physics, B.A.Sc. (Class of 2024)

Second Year CORE 2021-2022

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- MTHE 227 Vector Analysis F | 3
- MTHE 237 Differential Equations for Engineering Science F | 3.5
- ENPH 242 Relativity and Quanta F | 3.5
- ELEC 221 Electric Circuits F | 4.25
- ENPH 211 Applied Physics W | 3.5
- ENPH 239 Electricity and Magnetism W | 3.5
- ENPH 252 DELETED - 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 224 Continuous-Time Signals and Systems W | 3.75
- ELEC 252 Electronics I W | 4.25
- ELEC 278 Fundamentals of Information Structures F | 4

Minimum Units: 46.5

Materials Sub-Plan (P3)

- ENPH 225 Mechanics W | 3.5
- MECH 270 Materials Science and Engineering F | 3.5
- MECH 241 Fluid Mechanics I W | 3.5

Minimum Units: 45.25

Mechanical Sub-Plan (P4)

- ENPH 225 Mechanics W | 3.5
- MECH 230 Applied Thermodynamics I F | 3.5
- MECH 241 Fluid Mechanics I W | 3.5

Minimum Units: 45.25

Computing Sub-Plan (P6)

- CMPE 212 Introduction to Computing Science II F/W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ENPH 225 Mechanics W | 3.5

Minimum Units: 46.25

Third Year CORE 2022-2023

- 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
• ENPH 345 Quantum Physics of Atoms, Nuclei and Particles W | 3.5
• ENPH 353 Engineering Physics Experiment Design F | 2.5
• ENPH 316 Mathematical Methods in Physics I F | 3.5

Note:

* ENPH 317 can be taken in 3rd or 4th year and is a Physics List A elective.

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

APSC 303 may be taken as a List B technical elective for students that have successfully completed the internship program (QUIP).

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

Physics list A electives ENPH 491 and ENPH 495 typically are not offered every year, thus students may want to consider adding them to their third year program.

Note: In the third year of the Engineering Physics program students may apply to the Accelerated Masters program. In this program, students work closely with a supervisor in the summer after the third year of school doing research that leads towards a Masters degree in Physics or Engineering Physics. To accelerate students' progress towards a Masters degree, students take two graduate courses in their fourth year. These courses replace the Engineering Elective and a List "A" or List "B" course in the undergraduate program. Students enroll in ENPH 555 for their undergraduate thesis instead of ENPH 455. Students are admitted based on a minimum GPA of 3.7 and acceptance by a supervisor. Students are expected to finish their full Masters degree within 16 months after the undergraduate program, saving a year of time. For details see http://queensu.ca/physics/undergrad-studies/accelerated-msc-masc

Electrical Sub-Plan (P1)

• ELEC 353 Electronics II F | 4.25
• ELEC 324 Discrete-Time Signals and Systems F | 4
• ENPH 225 Mechanics W | 3.5
• ENPH 336 Solid State Devices W | 3.25
• ENPH 372 Thermodynamics W | 3.5

Minimum Units: 41.25

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

Minimum Units: 42
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

Minimum Units: 41.5

Computing Sub-Plan (P6)

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

Minimum Units: 43

Fourth Year CORE 2023-2024

- ENPH 431 Electromagnetic Theory F | 3.5
- ENPH 454 Advanced Engineering Physics Design Project F | 4.5
- ENPH 455 Engineering Physics Thesis FW | 4
- ENPH 453 Advanced Physics Laboratory W | 3.5
  Engineering Elective (any 300- or 400-level Engineering and Applied Science course) F/W | 3

Note:

* Students may take ENPH 555 as an alternative to ENPH 455. See the Notes regarding the Accelerated Masters program after the 3rd year program listing.

** 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.

Physics List A:

One from Physics List A:

- ENPH 317 Mathematical Methods in Physics II W | 3.5
- ENPH 321 Advanced Mechanics F | 3.5
- ENPH 414 Introduction to General Relativity W | 3
- ENPH 460 Laser Optics W | 3.5
- ENPH 472 Statistical Mechanics F | 3.5
- ENPH 479 High Performance Computing in Engineering Physics W | 3
- ENPH 480 Solid State Physics F | 3.5
- ENPH 483 NOT OFFERED 2022-2023 - Nanoscience and Nanotechnology W | 3.5
• ENPH 490 Nuclear Physics F | 3.5
• ENPH 491 NOT OFFERED 2022-2023 - Physics of Nuclear Reactors F | 3.5
• ENPH 495 Introduction to Medical Physics W | 3

Electrical Sub-Plan (P1)

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

Electrical List B:

• ELEC 326 Probability and Random Processes F | 3.5
• ELEC 333 Electric Machines W | 4.25
• ELEC 344 Sensors and Actuators F | 3.75
• ELEC 373 Computer Networks W | 3.5
• ELEC 408 NOT OFFERED 2022-2023 Biomedical Signal and Image Processing W | 3
• ELEC 409 NOT OFFERED 2022-2023 Bioinformatic Analytics F | 3
• ELEC 421 NOT OFFERED 2022-2023 Digital Signal Processing: Filters and System Design F | 4
• ELEC 422 NOT OFFERED 2022-2023 Digital Signal Processing: Random Models and Applications F | 3.5
• ELEC 431 Power Electronics F | 3.25
• ELEC 443 Linear Control Systems F | 4.25
• ELEC 448 Introduction to Robotics: Mechanics and Control F | 3.5
• ELEC 451 NOT OFFERED 2022-2023 Digital Integrated Circuit Engineering F | 3.25
• ELEC 454 NOT OFFERED 2022-2023 Analog Electronics W | 3.25
• ELEC 457 Integrated Circuits and System Applications F | 3.25
• ELEC 461 NOT OFFERED 2022-2023 Digital Communications F | 3.5
• ELEC 464 Wireless Communications W | 3
• ELEC 483 Microwave and RF Circuits and Systems W | 4.25
• ELEC 486 NOT OFFERED 2022-2023 Fiber Optic Communications F | 3.75
• CHEE 340 Biomedical Engineering W | 3.5

Note:

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

Minimum Units: 36.5

Materials Sub-Plan (P3)

• ENPH 480 Solid State Physics F | 3.5

Materials List B:

Two courses from Materials List B*:

• MECH 437 NOT OFFERED 2022-2023 - Fuel Cell Technology F | 3.5
• MECH 423 Introduction to Microsystems 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 Nano-Structured Materials F | 3.5
- MECH 483 Nuclear Materials F | 3.5
- MECH 484 DELETED - 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.

Minimum Units: 38

**Mechanical Sub-Plan (P4)**

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

**Mechanical List B:**

- CHEE 340 Biomedical Engineering W | 3.5
- MECH 420 NOT OFFERED 2022-2023 - Vibrations W | 3.5
- MECH 423 Introduction to Microsystems W | 3.5
- MECH 424 NOT OFFERED 2022-2023 - Sustainable Product Design F | 3.5
- MECH 430 NOT OFFERED 2022-2023 - Thermal Systems Design W | 4
- MECH 435 Internal Combustion Engines W | 3.5
- MECH 437 NOT OFFERED 2022-2023 - Fuel Cell Technology F | 3.5
- MECH 439 NOT OFFERED 2022-2023 Turbomachinery W | 3.5
- MECH 441 NOT OFFERED 2022-2023 - Fluid Mechanics III W | 3.5
- MECH 444 Computational Fluid Dynamics F | 3.5
- MECH 448 Compressible Fluid Flow W | 3.5
- MECH 452 NOT OFFERED 2022-2023 - Mechatronics Engineering W | 5
- MECH 456 Introduction to Robotics F | 3.5
- MECH 465 Computer-Aided Design F | 3.5
- MECH 480 Airplane Aerodynamics and Performance W | 3.5
- MECH 481 NOT OFFERED 2022-2023 Wind Energy F | 3.5
- MECH 482 NOT OFFERED 2022-2023 - Noise Control W | 3.5
- MECH 492 Biological Fluid Dynamics F | 3.5
- MECH 495 Ergonomics and Design F | 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.

Minimum Units: 37.5
Computing Sub-Plan (P6)

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

Computing List B:

- CHEE 340 Biomedical Engineering W | 3.5
- CMPE 330 Computer-Integrated Surgery F | 3
- CMPE 365 Algorithms I F | 4
- CMPE 452 Neural Networks and Genetic Algorithms F | 3
- CMPE 454 Computer Graphics W | 3
- CMPE 457 Image Processing and Computer Vision W | 3
- CMPE 458 Programming Language Processors W | 4
- CMPE 472 Medical Informatics W | 3
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- ELEC 374 Digital Systems Engineering W | 4.25
- ELEC 377 Operating Systems F | 4
- ELEC 408 NOT OFFERED 2022-2023 Biomedical Signal and Image Processing W | 3
- ELEC 409 NOT OFFERED 2022-2023 Bioinformatic Analytics F | 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.

Minimum Units: 36.5

Complementary Studies:

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

Engineering Physics, B.A.Sc. (Class of 2025)

Second Year CORE 2022-2023

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- MTHE 227 Vector Analysis F | 3
- MTHE 237 Differential Equations for Engineering Science F | 3.5
- ENPH 242 Relativity and Quanta F | 3.5
- ELEC 221 Electric Circuits F | 4.25
- ENPH 211 Applied Physics W | 3.5
- ENPH 239 Electricity and Magnetism W | 3.5
- ENPH 253 Engineering Physics Laboratory W | 3.5
- ENPH 213 Computational Engineering Physics W | 4

**Electrical Sub-Plan (P1)**
- ELEC 252 Electronics I W | 4.25
- ELEC 271 Digital Systems F | 4
- MREN 223 Signals and Systems W | 5

Minimum Units: 46.5

**Materials Sub-Plan (P3)**
- ENPH 225 Mechanics W | 3.5
- MECH 270 Materials Science and Engineering F | 3.5

Minimum Units: 45.25

**Mechanical Sub-Plan (P4)**
- ENPH 225 Mechanics W | 3.5
- MREN 230 Thermodynamics and Heat Transfer W | 3.75
- MREN 241 Fluid Mechanics and Fluid Power F | 3.75

Minimum Units: 45.25

**Computing Sub-Plan (P6)**
- CMPE 212 Introduction to Computing Science II F/W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ENPH 225 Mechanics W | 3.5

Minimum Units: 46.25

**Third Year CORE 2023-2024**
- 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
- ENPH 345 Quantum Physics of Atoms, Nuclei and Particles W | 3.5
- ENPH 353 Engineering Physics Experiment Design F | 2.5
- ENPH 316 Mathematical Methods in Physics I F | 3.5

**Notes:**

*ENPH 317 can be taken in 3rd or 4th year and is a Physics List A elective.*
** Students are free to take Complementary Studies courses at any time in their program that suits their interests, workloads, and schedules. Read explanatory notes on Complementary Studies at the end of this section.

APSC 303 may be taken as a List B technical elective for students that have successfully completed the internship program (QUIP).

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 the third year of the Engineering Physics program students may apply to the Accelerated Masters program. In this program, students work closely with a supervisor in the summer after the third year of school doing research that leads towards a Masters degree in Physics or Engineering Physics. To accelerate students' progress towards a Masters degree, students take two graduate courses in their fourth year. These courses replace the Engineering Elective and a List "A" or List "B" course in the undergraduate program. Students enroll in ENPH 555 for their undergraduate thesis instead of ENPH 455. Students are admitted based on a minimum GPA of 3.7 and acceptance by a supervisor. Students are expected to finish their full Masters degree within 16 months after the undergraduate program, saving a year of time. For details see http://queensu.ca/physics/undergrad-studies/accelerated-msc-masc

** Electrical Sub-Plan (P1)**

- ELEC 353 Electronics II F | 4.25
- ENPH 225 Mechanics W | 3.5
- ENPH 336 Solid State Devices W | 3.25
- ENPH 372 Thermodynamics W | 3.5
- ELEC 326 Probability and Random Processes F | 3.5

Minimum Units: 41.25

** 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

Minimum Units: 42

** 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 350 Automatic Control W | 3.5

Take a 300 or 400 level MECH course (MECH 333 excluded). Note, this does NOT count towards the 4th Year Mechanical List B choices.
Minimum Units: 41.5

Computing Sub-Plan (P6)

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

Minimum Units: 43

Fourth Year CORE 2024-2025

- ENPH 431 Electromagnetic Theory F | 3.5
- 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
  Engineering Elective (any 200-, 300- or 400-level Engineering and Applied Science course) F/W | 3

Notes:

* Students may take ENPH 555 as an alternative to ENPH 455. See the Notes regarding the Accelerated Masters program after the 3rd year program listing.

** 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.

One from Physics List A:

Physics List A:

- ENPH 317 Mathematical Methods in Physics II W | 3.5
- ENPH 321 Advanced Mechanics F | 3.5
- ENPH 414 Introduction to General Relativity W | 3
- ENPH 460 Laser Optics W | 3.5
- ENPH 472 Statistical Mechanics F | 3.5
- ENPH 479 High Performance Computing in Engineering Physics W | 3
- ENPH 480 Solid State Physics F | 3.5
- ENPH 483 NOT OFFERED 2022-2023 - Nanoscience and Nanotechnology W | 3.5
- ENPH 490 Nuclear Physics F | 3.5
- ENPH 491 NOT OFFERED 2022-2023 - Physics of Nuclear Reactors F | 3.5
- ENPH 495 Introduction to Medical Physics W | 3

Electrical Sub-Plan (P1)
Two courses from Electrical List B, and one course from Electrical List B or Physics List A, at least one of which must be numbered above 400*:

Electrical List B:

- ELEC 333 Electric Machines W | 4.25
- ELEC 344 Sensors and Actuators F | 3.75
- ELEC 373 Computer Networks W | 3.5
- ELEC 408 NOT OFFERED 2022-2023 Biomedical Signal and Image Processing W | 3
- ELEC 409 NOT OFFERED 2022-2023 Bioinformatic Analytics F | 3
- ELEC 421 NOT OFFERED 2022-2023 Digital Signal Processing: Filters and System Design F | 4
- ELEC 431 Power Electronics F | 3.25
- ELEC 443 Linear Control Systems F | 4.25
- ELEC 448 Introduction to Robotics: Mechanics and Control F | 3.5
- ELEC 454 NOT OFFERED 2022-2023 Analog Electronics W | 3.25
- ELEC 457 Integrated Circuits and System Applications F | 3.25
- ELEC 461 NOT OFFERED 2022-2023 Digital Communications F | 3.5
- ELEC 464 Wireless Communications W | 3
- ELEC 483 Microwave and RF Circuits and Systems W | 4.25
- ELEC 486 NOT OFFERED 2022-2023 Fiber Optic Communications F | 3.75
- CHEE 340 Biomedical Engineering W | 3.5
- MREN 318 Sensors and Electric Actuators F | 5.5

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.

Minimum Units: 36.5

Materials Sub-Plan (P3)

- ENPH 480 Solid State Physics F | 3.5

Materials List B:

Two courses from Materials List B*:

- MECH 437 NOT OFFERED 2022-2023 - Fuel Cell Technology F | 3.5
- MECH 423 Introduction to Microsystems 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 Nano-Structured Materials F | 3.5
- MECH 483 Nuclear Materials 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.

Minimum Units: 38

Mechanical Sub-Plan (P4)

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

Mechanical List B:

- CHEE 340 Biomedical Engineering W | 3.5
- MECH 420 NOT OFFERED 2022-2023 - Vibrations W | 3.5
- MECH 423 Introduction to Microsystems W | 3.5
- MECH 424 NOT OFFERED 2022-2023 - Sustainable Product Design F | 3.5
- MECH 430 NOT OFFERED 2022-2023 - Thermal Systems Design W | 4
- MECH 435 Internal Combustion Engines W | 3.5
- MECH 437 NOT OFFERED 2022-2023 - Fuel Cell Technology F | 3.5
- MECH 439 NOT OFFERED 2022-2023 Turbomachinery W | 3.5
- MECH 441 NOT OFFERED 2022-2023 - Fluid Mechanics III W | 3.5
- MECH 444 Computational Fluid Dynamics F | 3.5
- MECH 448 Compressible Fluid Flow W | 3.5
- MECH 452 NOT OFFERED 2022-2023 - Mechatronics Engineering W | 5
- MECH 456 Introduction to Robotics F | 3.5
- MECH 465 Computer-Aided Design F | 3.5
- MECH 480 Airplane Aerodynamics and Performance W | 3.5
- MECH 481 NOT OFFERED 2022-2023 Wind Energy F | 3.5
- MECH 482 NOT OFFERED 2022-2023 - Noise Control W | 3.5
- MECH 492 Biological Fluid Dynamics F | 3.5
- MECH 495 Ergonomics and Design F | 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.

Minimum Units: 37.5

Computing Sub-Plan (P6)

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

Computing List B:

- CHEE 340 Biomedical Engineering W | 3.5
• CMPE 330 Computer-Integrated Surgery F | 3
• CMPE 365 Algorithms I F | 4
• CMPE 452 Neural Networks and Genetic Algorithms F | 3
• CMPE 454 Computer Graphics W | 3
• CMPE 457 Image Processing and Computer Vision W | 3
• CMPE 458 Programming Language Processors W | 4
• CMPE 472 Medical Informatics W | 3
• ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
• ELEC 374 Digital Systems Engineering W | 4.25
• ELEC 377 Operating Systems F | 4
• ELEC 408 NOT OFFERED 2022-2023 Biomedical Signal and Image Processing W | 3
• ELEC 409 NOT OFFERED 2022-2023 Bioinformatic Analytics F | 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.

Minimum Units: 39.5

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.

First Year, Engineering and Applied Science

First Year Studies, B.A.Sc.

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

Electrical and Computer Engineering Innovation (ECEi) Stream

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

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

Details about these streams are listed in the calendar at:
First Year Curriculum

- APSC 199 English Proficiency for Engineers FW, S | K0.2
- APSC 101 Engineering Design and Practice F | K3.5
- APSC 102 Experimentation F/W | K2
- APSC 111 Physics I F | 3.3
- APSC 131 Chemistry and Materials F | 3.3
- APSC 143 Introduction to Computer Programming for Engineers F | K3.3
- APSC 151 Earth Systems Engineering F | 3.3
- APSC 171 Calculus I F | K3.3
- APSC 103 Engineering Client-based Design Project W | K3.5
- APSC 112 Physics II W | 3.3
  or
- APSC 114 Electricity and Magnetism W | 3.3
- APSC 132 Chemistry of Natural and Engineered Systems W | 3.3
- APSC 162 Engineering Graphics W | 2.5
- APSC 172 Calculus II W | 3.3
- APSC 174 Introduction to Linear Algebra W, S | 3.3

Minimum Total Credits: 43.1

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 Help Desk

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 Engineering Society (EngSoc) Engvents

The EngSoc 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 Engineering Society (EngSoc)'EngLinks' Tutoring System

For help using the EngSoc 'EngLinks' Tutoring 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 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.

Geological Engineering

Department Head  Dr. V.H. Remenda, PEng.
Chair of Undergraduate Studies  Dr. M. Diederichs, PEng, FEIC
Undergraduate Faculty Advisor  Dr. B. Vriens
Undergraduate Assistant  R. Dew
Office  Miller Hall, Bruce Wing
Telephone  (613) 533-2597
E-mail  geolugrd@queensu.ca
Departmental Web Site  http://www.queensu.ca/geol/

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

Geological Engineering at Queen's University prepares students for the creative problem solving, analysis, interpretation and decision making necessary to tackle engineering challenges related to:
• Design and application of advanced surface and subsurface investigation, field and lab data interpretation, advanced analysis and geological modelling in aid of engineering design;
• Environmental engineering including subsurface water resource exploration and protection, ground contaminant remediation, sustainable mine/urban/industrial waste management/engineering;
• Geotechnical engineering and construction on, with or through earth materials (rock and soil) including tunnels, caverns, mines, transportation infrastructure, foundations, dams, waste storage;
• Geo-hazard assessment and risk mitigation including landslides, subsidence, earthquakes and floods;
• Mineral and energy resource exploration, evaluation, development and sustainable management, including environmental protection and remediation before, during and after geo-resource extraction;
• Applied Geophysics (eg. Seismics, electro-magnetics, gravity, laser, radar, etc) for remote probing (from the ground or from space) and visualization of the subsurface environment to facilitate geotechnical, geo-hazard, geo-environmental or geo-resource engineering.

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

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

Geological Engineering Curriculum

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

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

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

Field Work

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

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

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

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

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

Geological Engineering, B.A.Sc. (Class of 2023)

Second Year CORE – 2020-2021

- APSC 200 Engineering Design and Practice II F/W | K4 *
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3 *
- APSC 293 Engineering Communications I F/W/S | K1 *
- CHEE 209 Analysis of Process Data F | 3.5
- CIVL 230 Solid Mechanics I F | 4.25
- GEOE 207 History of Life F | 3.5
- GEOE 221 Geological Engineering Field Methods F | 5
- GEOE 232 Mineralogy F | 4.5
- GEOE 235 Genesis and Characterization of Solid Earth Materials W | 4
- GEOE 238 Surficial Processes, Sedimentation and Stratigraphy W | 4
- GEOE 249 Geophysical Characterization of the Earth W | 3.5
- GEOE 281 Introduction to Geological Engineering F | 4
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5 *
*Note: Students in GEOE take APSC 221, APSC 200, 293 and MTHE 225 in the Winter term.

Minimum Total Credits: 46.75

*Note: GEOE 300 will be taken August 2022, prior to 4th year due to Covid-19 setbacks.

Third Year CORE – 2021-2022

- CIVL 340 Geotechnical Engineering I F | 3.75
- GEOE 300 Geological Engineering Field School F | K4 *
- GEOE 313 Engineering Geology and Geomechanics W | 4
- GEOE 319 Applied Geophysics W | 4.5
- GEOE 321 Analysis of Rock Structures F | 4
- GEOE 333 Terrain Evaluation W | 4
- GEOE 343 Applied Hydrogeology F | 3.5
- GEOE 345 Site Investigation & Geological Engineering Design W | 4
- GEOE 359 Applied Quantitative Analysis in Geological Engineering F | 3.5
- GEOE 362 Resource Engineering W | 4.5
• GEOE 365 Geochemical Characterization of the Earth F | 4
  • Technical Elective F/W | 3.5

Minimum Total Credits: 42.75

* Please note in 3rd year *GEOE 300 will be taken in late August.

Fourth Year CORE - 2022-2023

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

• GEOE 446 Engineering Design Project I F | K4 * *
• GEOE 447 Engineering Design Project II W | K5.5
• Technical Elective F/W | 3.5
• Technical Elective F/W | 3.5
• Technical Elective F/W | 3.5
• Technical Elective F/W | 3.5
• Technical Elective F/W | 3.5
• Technical Elective F/W | 3.5
• Complementary Studies Elective F/W | 3
• Complementary Studies Elective F/W | 3
• Complementary Studies Elective F/W | 3

Minimum Total Credits:32.5

Electives (Class of 2023)

The Geological Engineering student requires a total of 17.5 TECHNICAL ELECTIVE (TE) CREDITS (210 AUs). These are typically, (but not exclusively) taken as 5 TE elective courses with a minimum average of 3.5 Credits or 42 AUs per course. These courses can be taken at any point during the program to accommodate timetabling but normally only in third and fourth year. Students should plan to ensure that prerequisite and corequisite requirements are met for the full suite of TE or CS electives they wish to take during their program. Students should note that a reduction of total course load to less than 80% of the normal load may prevent them from holding Queen's University scholarships.

It is mandatory that at least 7 Credits of Technical Electives (TE) be taken from the following list: APSC 381, APSC 480, CIVL 215, CIVL 250, CIVL 341, CIVL 443, CIVL 471, GEOE 410, GEOE 413, GEOE 462, MINE 321, MINE 467.

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): 3 credits from List A and 6 credits from Lists A or B.

Geological Engineering, B.A.Sc. (Class of 2024)

Second Year CORE 2021-2022
• APSC 200 Engineering Design and Practice II F/W | K4 *
• APSC 221 Economics and Business Practices in Engineering F/W/S | 3 *
• APSC 293 Engineering Communications I F/W/S | K1 *
• CHEE 209 Analysis of Process Data F | 3.5
• CIVL 230 Solid Mechanics I F | 4.25
• GEOE 207 History of Life F | 3.5
• GEOE 221 Geological Engineering Field Methods F | 5
• GEOE 232 Mineralogy F | 4.5
• GEOE 235 Genesis and Characterization of Solid Earth Materials W | 4
• GEOE 238 Surficial Processes, Sedimentation and Stratigraphy W | 4
• GEOE 249 Geophysical Characterization of the Earth W | 3.5
• GEOE 281 Introduction to Geological Engineering F | 4
• MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5 *

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

Minimum Units: 47.25

Intersession (Taken at the end of August before 3rd Year)

• GEOE 300 Geological Engineering Field School F | K4

Third Year CORE 2022-2023

• CIVL 340 Geotechnical Engineering I F | 3.75
• GEOE 313 Engineering Geology and Geomechanics W | 4
• GEOE 319 Applied Geophysics W | 4.5
• GEOE 321 Analysis of Rock Structures F | 4
• GEOE 333 Terrain Evaluation W | 4
• GEOE 343 Applied Hydrogeology F | 3.5
• GEOE 345 Site Investigation & Geological Engineering Design W | 4
• GEOE 359 Applied Quantitative Analysis in Geological Engineering F | 3.5
• GEOE 362 Resource Engineering W | 4.5
• GEOE 365 Geochemical Characterization of the Earth F | 4
• Technical Elective F/W | 3.5

Minimum Units: 43.25

Fourth Year CORE 2023-2024

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

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

• GEOE 410 Geological Engineering Field School F | K4 *
• GEOE 419 NOT OFFERED 2022-2023 Engineering Geophysics Field School F | K4 *
• GEOE 446 Engineering Design Project I F | K4
• GEOE 447 Engineering Design Project II W | K5.5
• Technical Elective F/W | 3.5
Minimum Units: 33.5

Electives (Classes of 2024)

The Geological Engineering student requires a total of 17.5 TECHNICAL ELECTIVE (TE) CREDITS (210 AUs). These are typically, (but not exclusively) taken as 5 TE elective courses with a minimum average of 3.5 Credits or 42 AUs per course. These courses can be taken at any point during the program to accommodate timetabling but normally only in third and fourth year. Students should plan to ensure that prerequisite and corequisite requirements are met for the full suite of TE or CS electives they wish to take during their program. Students should note that a reduction of total course load to less than 80% of the normal load may prevent them from holding Queen's University scholarships.

It is mandatory that at least 7 Credits of Technical Electives (TE) be taken from the following list: APSC 381, APSC 480, CIVL 215, CIVL 250, CIVL 341, CIVL 443, CIVL 471, GEOE 410, GEOE 413, GEOE 462, MINE 321, MINE 467.

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): 3 credits from List A and 6 credits from Lists A or B.

Geological Engineering, B.A.Sc. (Class of 2025)

Second Year CORE 2022-2023

- APSC 200 Engineering Design and Practice II F/W | K4 *
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3 *
- APSC 293 Engineering Communications I F/W/S | K1 *
- CHEE 209 Analysis of Process Data F | 3.5
- CIVL 230 Solid Mechanics I F | 4.25
- GEOE 207 History of Life F | 3.5
- GEOE 221 Geological Engineering Field Methods F | 5
- GEOE 232 Mineralogy F | 4.5
- GEOE 235 Genesis and Characterization of Solid Earth Materials W | 4
- GEOE 238 Surficial Processes, Sedimentation and Stratigraphy W | 4
- GEOE 249 Geophysical Characterization of the Earth W | 3.5
- GEOE 281 Introduction to Geological Engineering F | 4
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5 *
*Note: Students in GEOE take APSC 221, APSC 200, APSC 293 and MTHE 225 in the Winter term.

Minimum Total Credits: 47.25

Intersession (Taken at the end of August before 3rd year)

- GEOE 300 Geological Engineering Field School F | K4

Third Year CORE 2023-2024

- CIVL 340 Geotechnical Engineering I F | 3.75
- GEOE 313 Engineering Geology and Geomechanics W | 4
- GEOE 319 Applied Geophysics W | 4.5
- GEOE 321 Analysis of Rock Structures F | 4
- GEOE 333 Terrain Evaluation W | 4
- GEOE 343 Applied Hydrogeology F | 3.5
- GEOE 345 Site Investigation & Geological Engineering Design W | 4
- GEOE 359 Applied Quantitative Analysis in Geological Engineering F | 3.5
- GEOE 362 Resource Engineering W | 4.5
- GEOE 365 Geochemical Characterization of the Earth F | 4
- Technical Elective F/W | 3.5

Minimum Total Credits: 43.25

Fourth Year CORE 2024-2025

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

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

- GEOE 410 Geological Engineering Field School F | K4 *
- GEOE 419 NOT OFFERED 2022-2023 Engineering Geophysics Field School F | K4 *
- GEOE 446 Engineering Design Project I F | K4
- GEOE 447 Engineering Design Project II W | K5.5
- Technical Elective F/W | 3.5
- Technical Elective F/W | 3.5
- Technical Elective F/W | 3.5
- Technical Elective F/W | 3.5
- Complementary Studies Elective F/W | 3
- Complementary Studies Elective F/W | 3

Minimum Total Credits: 33.5

Electives

The Geological Engineering student requires a total of 17.5 TECHNICAL ELECTIVE (TE) CREDITS (210 AUs). These are typically, (but not exclusively) taken as 5 TE elective courses with a minimum average of 3.5 Credits or 42 AUs per course. These courses can be taken at any point during the program to accommodate timetabling but normally
only in third and fourth year. Students should plan to ensure that prerequisite and corequisite requirements are met for the full suite of TE or CS electives they wish to take during their program. Students should note that a reduction of total course load to less than 80% of the normal load may prevent them from holding Queen's University scholarships.

It is mandatory that at least 7 Credits of Technical Electives (TE) be taken from the following list: APSC 381, APSC 480, CIVL 215, CIVL 250, CIVL 341, CIVL 443, CIVL 471, GEOE 410, GEOE 413, GEOE 462, MINE 321, MINE 467.

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): 3 credits from List A and 6 credits from Lists A or B.

Geological Engineering: Technical Electives

All courses on this list can be counted as Technical Elective unless they have already been taken as core. Some of these elective courses may not be available to all students due to prerequisite course requirements. Some courses are offered in alternating years. The student is responsible for confirming that he/she has the necessary prerequisites or permission of the instructor. For some courses that are part of other program cores and subject to internal enrollment restrictions, permission of the instructor may be required even if prerequisites are met. Other technical courses (courses with level 200+ that do not appear in the complimentary studies list for APSC) may be considered as eligible Technical Electives with the permission of the GEOE academic advisor and GEOE curriculum chair, and if the instructor of the course permits the student to register.

Technical Electives List

- APSC 250 NOT OFFERED 2022-2023 Biology Through an Engineering Lens S/OL | K3.5
- APSC 303 Professional Internship | 3.5 *Pending successful completion of Queen's Internship Program (QUIP)
- APSC 381 Advanced Design and Skills for Innovation W | K3.5
- APSC 480 NOT OFFERED 2022-23 Multi-disciplinary Industry Engineering Design Project FW | K9
- CHEE 324 NOT OFFERED 2022-2023 Organic Process Development W | 3.5
- CHEE 371 Mitigation of Industrial Pollution W | 3.5
- CIVL 215 Materials for Civil Engineers W | 4.5
- CIVL 231 Solid Mechanics II W | 4.5
- CIVL 250 Hydraulics I W | 4
- CIVL 350 Hydraulics II F | 3.75
- CIVL 340 Geotechnical Engineering I F | 3.75
- CIVL 341 Geotechnical Engineering II W | 4
- CIVL 371 Groundwater Engineering F | 3.75
- CIVL 442 Geotechnical Design F | 3.75
- CIVL 443 Geoenvironmental Design W | 4
- CIVL 451 Lake, Reservoir and Coastal Engineering F | 3.75
- CIVL 455 River Engineering F | 4
- CIVL 471 Subsurface Contamination F | 4
- CHEE 484 NOT OFFERED 2022-2023 Bioremediation W | 3.5
• CMPE 320 Fundamentals of Software Development F | 4
• ELEC 210 DELETED Introductory Electric Circuits and Machines W | 4.25
• ELEC 221 Electric Circuits F | 4.25
• ELEC 278 Fundamentals of Information Structures F | 4
• ELEC 279 Introduction to Object Oriented Programming W | 4
• ELEC 280 Fundamentals of Electromagnetics W | 3.75
• ELEC 381 Applications of Electromagnetics W | 3.75
• ENCH 213 Introduction to Chemical Analysis F | 4.75
• ENPH 225 Mechanics W | 3.5
• ENPH 239 Electricity and Magnetism W | 3.5
• ENPH 334 Electronics for Applied Scientists F | 5
• GEOE 301 Field Studies in Geology F | 1.5
• GEOE 337 Paleontology F | 3.75
• GEOE 340 Problems in Geological Engineering F/W | 3
• GEOE 341 Special Topics in Applied Geology F/W/S | 3
• GEOE 343 Applied Hydrogeology F | 3.5
• GEOE 368 Carbonate Sedimentology F | 4.5
• GEOE 401 Field Studies in Geology II F | 1.5
• GEOE 410 Geological Engineering Field School F | K4
• GEOE 413 Rock Engineering Design F | 3.5
• GEOE 414 Foundations of the Oil and Gas Industry W | 3.5
• GEOE 418 Petroleum Geology F | 4.5
• GEOE 419 NOT OFFERED 2022-2023 Engineering Geophysics Field School F | K4
• GEOE 439 Advanced Applied Geophysics F | K3
• GEOE 452 Instrumental Techniques Applied to the Study of Solids W | 3
• GEOE 462 Advanced Petrogenesis and Metallogenesis W | 4.5
• GEOE 463 Spatial Information Management in the Geosciences F | 3.5
• GEOE 464 Visualization in Geosciences W | 1.5
• GEOE 466 Isotopes and the Environment W | 4
• GEOE 475 Exploration and Environmental Geochemistry F | 4.3
• GEOE 478 Terrigenous Clastic Sedimentology F | 3.5
• GEOE 481 Structural Analysis Applied to Resource Deposits W | 3.5
• GEOE 488 Geology of North America F | 3
• GPHY 304 Arctic and Periglacial Environments W | 3
• MINE 321 Drilling and Blasting F | 4.5
• MINE 330 Mineral Industry Economics F | 3.5
• MINE 335 Mineral Processing F | 3
• MINE 422 Mining and Sustainability F | 4
• MINE 467 Geostatistics and Orebody Modelling F | 4.5
• MNTC 408 Mine Health and Safety O/L | 3
• MTHE 227 Vector Analysis F | 3
• MTHE 228 Complex Analysis W | 3.5
• MTHE 339 NOT OFFERED 2022-2023 Evolutionary Game Theory W | 3
• ENPH 242 Relativity and Quanta F | 3.5
• MECH 228 Kinematics and Dynamics F/W | K3.5
• MECH 230 Applied Thermodynamics I F | 3.5
• MECH 270 Materials Science and Engineering F | 3.5
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, Applied Mechanics (M6): Technical Electives

List I:

(choose AT LEAST TWO courses)

- MTHE 353 Probability II W | 3
- MTHE 406 Introduction to Coding Theory F | 3
- MTHE 418 NOT OFFERED 2022-2023 - Number Theory and Cryptography W | 3
- MTHE 434 NOT OFFERED 2022-2023 - Optimization Theory with Applications to Machine Learning W | 3.5
- MTHE 472 Optimization and Control of Stochastic Systems W | 3.5
- MTHE 437 Topics in Applied Mathematics W | 3.5
- MTHE 439 NOT OFFERED 2022-2023 - Lagrangian Mechanics, Dynamics, and Control W | 3.5
- MTHE 457 Statistical Learning W | 3
- MECH 346 Heat Transfer W | 3.5
- MECH 420 NOT OFFERED 2022-2023 - Vibrations W | 3.5
- MECH 424 NOT OFFERED 2022-2023 - Sustainable Product Design F | 3.5
- MECH 435 Internal Combustion Engines W | 3.5
- MECH 439 NOT OFFERED 2022-2023 - Turbomachinery W | 3.5
- MECH 441 NOT OFFERED 2022-2023 - Fluid Mechanics III W | 3.5
- MECH 444 Computational Fluid Dynamics F | 3.5
- MECH 448 Compressible Fluid Flow W | 3.5
- MECH 452 NOT OFFERED 2022-2023 - Mechatronics Engineering W | 5
- MECH 455 Computer Integrated Manufacturing F | 3.5
- MECH 456 Introduction to Robotics F | 3.5
  OR
- ELEC 448 Introduction to Robotics: Mechanics and Control F | 3.5
- MECH 465 Computer-Aided Design F | 3.5
- MECH 480 Airplane Aerodynamics and Performance W | 3.5
- MECH 482 NOT OFFERED 2022-2023 - Noise Control W | 3.5
- MECH 492 Biological Fluid Dynamics F | 3.5
- MECH 494 Kinematics of Human Motion W | 3.5
- MECH 495 Ergonomics and Design F | 3.5
- MECH 496 Musculoskeletal Biomechanics F | 3.5
- MECH 430 NOT OFFERED 2022-2023 - Thermal Systems Design W | 4
- MINE 472 Not Offered 2021-2022 Mining Systems, Automation, and Robotics O/L | K3.5

Mathematics and Engineering, B.A.Sc. (Class of 2023)

Second Year Common Core - 2020-2021

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

Applied Mechanics Sub-Plan (M6)

- ENPH 252 DELETED - Management of Experimental Data W | 1.25
- MECH 210 Electronic Circuits and Motors for Mechatronics W | K4.5
- MECH 221 Solid Mechanics I F | 3.5
- MECH 228 Kinematics and Dynamics F/W | K3.5
- MECH 230 Applied Thermodynamics I F | 3.5
- MECH 241 Fluid Mechanics I W | 3.5

Minimum Total Credits: 42.5

Computing and Communications Sub-Plan (M9)
- CMPE 212 Introduction to Computing Science II F/W | 4
- ELEC 271 Digital Systems F | 4
- ELEC 274 Computer Architecture W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ENPH 239 Electricity and Magnetism W | 3.5

Minimum Total Credits: 41.75

Systems and Robotics Sub-Plan (M11)

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

Minimum Total Credits: 42.25

Third Year Common Core - 2021-2022

- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- MTHE 326 Functions of a Complex Variable F | 3.5
- MTHE 332 NOT OFFERED 2022-2023 - Introduction to Control W | 4
- MTHE 334 NOT OFFERED 2022-2023 - 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

Applied Mechanics Sub-Plan (M6)
• 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 341 Fluid Mechanics II W | 3.5
• MECH 398 Mechanical Engineering Laboratory I F | K2
• MECH 399 Mechanical Engineering Laboratory II W | K2

Minimum Total Credits: 44
Computing and Communications Sub-Plan (M9)

- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- MTHE 351 Probability I F | 3.5
- MTHE 353 Probability II W | 3
- CMPE 365 Algorithms I F | 4
- CMPE 320 Fundamentals of Software Development F | 4
- CMPE 332 Database Management Systems W | 3

Minimum Total Credits: 43

Systems and Robotics Sub-Plan (M11)

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

Minimum Total Credits: 42.5

Fourth Year Common Core - 2022-2023

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

Applied Mechanics Sub-Plan (M6)

- MTHE 430 Control Theory F | 4
- MTHE 351 Probability I F | 3.5
- Complementary Studies, List A F/W | 3
- Complementary Studies, List A or B F/W | 3
- Complementary Studies, List A or B F/W | 3
- MTHE 433 Continuum Mechanics with Applications F | 3

Electives

M6 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, 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 (M6): Technical Electives
Minimum Total Credits: 42

Computing and Communications Sub-Plan (M9)

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

Electives

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

Minimum Total Credits: 41.5

Systems and Robotics Sub-Plan (M11)

- MTHE 430 Control Theory F | 4
- MTHE 474 Information Theory F | 3.5
- MTHE 472 Optimization and Control of Stochastic Systems W | 3.5
- Complementary Studies, List A or B F/W | 3
- Complementary Studies, List A or B F/W | 3

Electives

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

Minimum Total Credits: 39.5

**Complementary Studies**

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

Mathematics and Engineering, B.A.Sc. (Class of 2024)

**Second Year Common Core - 2021-2022**

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

**Applied Mechanics Sub-Plan (M6)**

- MECH 221 Solid Mechanics I F | 3.5
• MECH 230 Applied Thermodynamics I F | 3.5
• ENPH 252 DELETED - Management of Experimental Data W | 1.25
• MECH 228 Kinematics and Dynamics F/W | K3.5
• MECH 241 Fluid Mechanics I W | 3.5
• MECH 210 Electronic Circuits and Motors for Mechatronics W | K4.5

Minimum Total Credits: 42.5

Computing and Communications Sub-Plan (M9)

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

Minimum Total Credits: 41.75

Systems and Robotics Sub-Plan (M11)

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

Minimum Total Credits: 42.25

Third Year Common Core - 2022-2023

• MTHE 326 Functions of a Complex Variable 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
• MTHE 328 Real Analysis W | 3
• MTHE 351 Probability I F | 3.5

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

Computing and Communications Sub-Plan (M9)

- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- MTHE 353 Probability II W | 3
- CMPE 320 Fundamentals of Software Development F | 4
- CMPE 332 Database Management Systems W | 3
- CMPE 365 Algorithms I F | 4
- Complementary Studies, List A F/W | 3

Minimum Total Credits: 41.5

Systems and Robotics Sub-Plan (M11)

- ELEC 278 Fundamentals of Information Structures F | 4
- ENPH 239 Electricity and Magnetism W | 3.5
- MTHE 353 Probability II W | 3
- Take MTHE 337 or another Technical Elective List I or List II F/W | 3
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- Complementary Studies, List A F/W | 3

Minimum Total Credits: 41

Fourth Year Common Core - 2023-2024

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

Applied Mechanics Sub-Plan (M6)

- MTHE 430 Control Theory F | 4
- Complementary Studies, List A F/W | 3
- Complementary Studies, List A or B F/W | 3
- Complementary Studies, List A or B F/W | 3
- MTHE 433 Continuum Mechanics with Applications F | 3

Elective

M6 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, 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.
Computing and Communications Sub-Plan (M9)

- MTHE 474 Information Theory F | 3.5
- MTHE 455 Stochastic Processes and Applications F | 3.5
- Complementary Studies, List A or B F/W | 3
- Complementary Studies, List A or B F/W | 3
- MTHE 477 Data Compression and Source Coding: Theory and Algorithms 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, 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.

Systems and Robotics Sub-Plan (M11)

- MTHE 430 Control Theory F | 4
- MTHE 472 Optimization and Control of Stochastic Systems W | 3.5
- MTHE 474 Information Theory F | 3.5
- Complementary Studies, List A or B F/W | 3
- Complementary Studies, List A or B F/W | 3

Elective

M11 students must choose 4 technical electives in addition to third year technical elective: a minimum of two (2) technical electives 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, Systems and Robotics (M11): Technical Electives

Minimum Total Credits: 39.5

**Complementary Studies**

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

**Mathematics and Engineering, B.A.Sc. (Class of 2025)**

**Second Year CORE 2022-2023**

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- MTHE 212 Linear Algebra W | 3.5
- MTHE 217 Algebraic Structures with Applications F | 3.5
- MTHE 237 Differential Equations for Engineering Science F | 3.5
- MTHE 280 Advanced Calculus F | 3.5
- MTHE 281 Introduction to Real Analysis W | 3.5
Applied Mechanics Sub-Plan (M6)

- MECH 221 Solid Mechanics I F | 3.5
- MECH 210 Electronic Circuits and Motors for Mechatronics W | 4.5
- MREN 230 Thermodynamics and Heat Transfer W | 3.75
- MREN 241 Fluid Mechanics and Fluid Power F | 3.75
- ENPH 225 Mechanics W | 3.5

Minimum Total Credits: 41.25

Computing and Communications Sub-Plan (M9)

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

Minimum Total Credits: 41.75

Systems and Robotics Sub-Plan (M11)

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

Minimum Total Credits: 42.25

Third Year CORE 2023-2024

- MTHE 326 Functions of a Complex Variable 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
- MTHE 328 Real Analysis W | 3
- MTHE 351 Probability I F | 3.5

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

Computing and Communications Sub-Plan (M9)

- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- MTHE 353 Probability II W | 3
- CMPE 320 Fundamentals of Software Development F | 4
- CMPE 332 Database Management Systems W | 3
- CMPE 365 Algorithms I F | 4
- Complementary Studies, List A F/W | 3

Minimum Total Credits: 41.5

Systems and Robotics Sub-Plan (M11)

- ELEC 278 Fundamentals of Information Structures F | 4
- ENPH 239 Electricity and Magnetism W | 3.5
- MTHE 353 Probability II W | 3
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- Complementary Studies, List A F/W | 3
- Take MTHE 337 or another Technical Elective List I or List II F/W | 3

Minimum Total Credits: 41

Fourth Year CORE 2024-2025

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

Applied Mechanics Sub-Plan (M6)

- MTHE 430 Control Theory F | 4
- Complementary Studies, List A F/W | 3
- Complementary Studies, List A or B F/W | 3
- Complementary Studies, List A or B F/W | 3
- MTHE 433 Continuum Mechanics with Applications F | 3

Electives

M6 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, 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 (M6): Technical Electives

Minimum Total Credits: 38.5

Computing and Communications Sub-Plan (M9)

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

Electives

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

Minimum Total Credits: 38.5

Systems and Robotics Sub-Plan (M11)

- MTHE 430 Control Theory F | 4
- MTHE 474 Information Theory F | 3.5
- MTHE 472 Optimization and Control of Stochastic Systems W | 3.5
- Complementary Studies, List A or B F/W | 3
- Complementary Studies, List A or B F/W | 3

Electives

M11 students must choose 4 technical electives in addition to their Third Year Technical Elective: a minimum of two (2) technical electives 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, Systems and Robotics (M11): Technical Electives

Minimum Total Credits: 39.5

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, Computing and Communications (M9): Technical Electives

List I:

(choose AT LEAST TWO courses)

- MTHE 406 Introduction to Coding Theory F | 3
- MTHE 418 NOT OFFERED 2022-2023 - Number Theory and Cryptography W | 3
- MTHE 430 Control Theory F | 4
- MTHE 434 NOT OFFERED 2022-2023 - Optimization Theory with Applications to Machine Learning W | 3.5
- MTHE 472 Optimization and Control of Stochastic Systems W | 3.5
- MTHE 478 NOT OFFERED 2022-2023 - Topics in Communication Theory F/W | 3
- MTHE 484 NOT OFFERED 2022-2023 - Data Networks W | 3
- MTHE 454 NOT OFFERED 2022-2023 - Statistical Spectrum Estimation W | 3
- MTHE 437 Topics in Applied Mathematics W | 3.5
- MTHE 433 Continuum Mechanics with Applications F | 3
- MTHE 439 NOT OFFERED 2022-2023 - Lagrangian Mechanics, Dynamics, and Control W | 3.5
- MTHE 457 Statistical Learning W | 3

List II:

- CMPE 434 NOT OFFERED 2022-2023 Distributed Systems F | 3
- CMPE 454 Computer Graphics W | 3
- CMPE 457 Image Processing and Computer Vision W | 3
- ELEC 374 Digital Systems Engineering W | 4.25
- ELEC 377 Operating Systems F | 4
- ELEC 421 NOT OFFERED 2022-2023 Digital Signal Processing: Filters and System Design F | 4
- ELEC 461 NOT OFFERED 2022-2023 Digital Communications F | 3.5
- ELEC 464 Wireless Communications W | 3
- ELEC 470 Computer System Architecture W | 3.5
- ELEC 373 Computer Networks W | 3.5
Mathematics and Engineering, Systems and Robotics (M11): Technical Electives

List I:

*(choose AT LEAST TWO courses)*

- MTHE 406 Introduction to Coding Theory F | 3
- MTHE 434 NOT OFFERED 2022-2023 - Optimization Theory with Applications to Machine Learning W | 3.5
- MTHE 439 NOT OFFERED 2022-2023 - Lagrangian Mechanics, Dynamics, and Control W | 3.5
- MTHE 477 Data Compression and Source Coding: Theory and Algorithms W | 3
- MTHE 478 NOT OFFERED 2022-2023 - Topics in Communication Theory F/W | 3
- MTHE 484 NOT OFFERED 2022-2023 - Data Networks W | 3
- MTHE 454 NOT OFFERED 2022-2023 - Statistical Spectrum Estimation W | 3
- MTHE 455 Stochastic Processes and Applications F | 3.5
- MTHE 433 Continuum Mechanics with Applications F | 3
- MTHE 437 Topics in Applied Mathematics W | 3.5
- MTHE 418 NOT OFFERED 2022-2023 - Number Theory and Cryptography W | 3
- MTHE 457 Statistical Learning W | 3

List II:

- ELEC 353 Electronics II F | 4.25
- ELEC 421 NOT OFFERED 2022-2023 Digital Signal Processing: Filters and System Design F | 4
- ELEC 431 Power Electronics F | 3.25
- ELEC 448 Introduction to Robotics: Mechanics and Control F | 3.5
  OR
- MECH 456 Introduction to Robotics F | 3.5
- ELEC 454 NOT OFFERED 2022-2023 Analog Electronics W | 3.25
- ELEC 457 Integrated Circuits and System Applications F | 3.25
- ELEC 461 NOT OFFERED 2022-2023 Digital Communications F | 3.5
- ELEC 464 Wireless Communications W | 3
- ELEC 483 Microwave and RF Circuits and Systems W | 4.25
- ELEC 486 NOT OFFERED 2022-2023 Fiber Optic Communications F | 3.75
- MECH 452 NOT OFFERED 2022-2023 - Mechatronics Engineering W | 5
- MINE 472 Not Offered 2021-2022 Mining Systems, Automation, and Robotics O/L | K3.5

Mechanical Engineering

Department Head: K. Pilkey

Chair of Undergraduate Studies: Darko Matovic (Fall 2019)
Chair of Undergraduate Studies: Gene Zak (Winter 2020)

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

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

Options available:

- Materials Option
- Biomechanical Option

Mechanical and Materials Engineering, B.A.Sc. (Class of 2023)

Second Year Common Core - 2020/2021

- MECH 202 Mathematical and Computational Tools for Mechanical Engineers I F | K3.5
- MECH 211 Manufacturing Methods F | 3.5
- MECH 212 Machine Tool Laboratory F/W | 1.0
- MECH 217 Measurement in Mechatronics F | 4.25
- MECH 221 Solid Mechanics I F | 3.5
- MECH 230 Applied Thermodynamics I F | 3.5
- MECH 270 Materials Science and Engineering F | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- MECH 203 Mathematical and Computational Tools for Mechanical Engineers II W | K3.5
- MECH 210 Electronic Circuits and Motors for Mechatronics W | K4.5
- MECH 228 Kinematics and Dynamics F/W | K3.5
- MECH 241 Fluid Mechanics I W | 3.5
- MECH 273 Materials Science and Engineering Lab W | 1.0

Minimum Total Credits: 44.25

Students take either MECH 211 and MECH 212, or MECH 213. MECH 213 combines the content of 211 and 212 in a single course.
Note: Students should be aware that a transfer or a change in option choice may result in their program requirements taking more than the typical 4 years because of course availability and conflicts in their core timetable. The department cannot guarantee that courses will not conflict when a student changes options or transfers, especially after 2nd year.

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

Third Year Common Core - 2021/2022

- MECH 302 Mathematical and Computational Tools for Mechanical Engineers III F | K3.5
- MECH 310 Digital Systems for Mechatronics F | K4.5
- MECH 321 Solid Mechanics II F | 3.5
- MECH 328 Dynamics and Vibration F | 3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- MECH 323 Machine Design W | 4.5
- MECH 346 Heat Transfer W | 3.5
- MECH 350 Automatic Control W | 3.5

General Sub-Plan (ME1)

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

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

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

- MECH 393 Biomechanical Product Development W | 3.5
Minimum Total Credits: 40.5

Fourth Year Common Core - 2022/2023

- Complementary Studies, List A, F or W | 3
- Complementary Studies, List A or B, F or W | 6
- ME1 and ME2 Technical Electives (See Technical Elective List) F and W | 20.5
- ME3 Technical Electives (See Technical Elective List) F and W | 17.0

Important to Note: The above list is for a typical fourth year program and may vary depending on choices in previous years. Students must have a minimum total of 9 credits of Complementary Studies electives and a minimum of 23.5 credits of Technical Electives in the ME1 and ME2 options, and a minimum of 20.0 credits of Technical Electives in the ME3 option, as detailed below. This count includes any 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: 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
- MECH 464 Communications and Project Management F | 1.5
- MECH 462 Team Project - Implement and Operate W | K3.5

Minimum Total Credits: 35

All students must take a final year capstone design course in their program. For the ME1 and ME2 option students this course would normally be MECH 460 (4 credits, Fall) coupled with MECH 464 (1.5 credits, Fall). ME3 students will normally take MECH 460 (4 credits, Fall) coupled with MECH 464 (1.5 credits, Fall), in addition to MECH 462 (3.5 credits, Winter).
However, students in the ME1 and ME2 options may choose to take APSC 480 (9 credits, Fall and Winter), Multi-disciplinary Industry Engineering Design Project as a substitute for MECH 460 and MECH 464, and if the case will receive 3.5 credits of List 1 technical electives that will count towards their required minimum technical elective credit count.

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

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

Complementary Studies

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

Technical Electives

Students are required to complete technical electives dependent on their option, as listed below:

**ME1 Option**

A minimum of 17.0 credits from any combination of courses on Lists 1, 2 or 3

A minimum of 3.5 additional credits from any combination of courses on Lists 1, 2, 3 or 4

For a minimum total requirement of technical electives of 20.5 credits

**ME2 Option**

A minimum of 10.0 credits from courses on List 2

A minimum of 7.0 additional credits from any combination of courses on Lists 1, 2 or 3

A minimum of 3.5 additional credits from any combination of courses on Lists 1, 2, 3 or 4

For a minimum total requirement of technical electives of 20.5 credits

**ME3 Option**

A minimum of 10.0 credits from courses on List 3

A minimum of 3.5 additional credits from any combination of courses on Lists 1, 2 or 3

A minimum of 3.5 additional credits from any combination of courses on Lists 1, 2, 3 or 4

For a minimum total requirement of technical electives of 17.0 credits

(Note that ME3 students are required to take MECH 462 as core, but it is an optional List 1 technical elective for ME1 and ME2 students. Students take the same total load in all three options.)
(As an example, 17.5 from List 1, 2 or 3; 3.0 from List 4 would also satisfy the ME1 requirement.)

For all courses, students must meet the prerequisite requirements and no exclusion courses are allowed. Any exception to the requirements above must be approved by the Undergraduate Chair. It is the sole responsibility of the student to ensure that elective weights are sufficient to meet the total technical elective requirement.

All course availabilities and the term in which a course is held can change from one academic year to the next. This can occur due to curriculum changes, instructor availability or a change in departmental resources. Please refer to the individual course descriptions in the current calendar for further details.

Mechanical and Materials Engineering: Technical Elective Lists

Mechanical and Materials Engineering, B.A.Sc. (Class of 2024)

Second Year Common Core- 2021-2022

- MECH 202 Mathematical and Computational Tools for Mechanical Engineers I F | K3.5
- MECH 211 Manufacturing Methods F | 3.5
- MECH 212 Machine Tool Laboratory F/W | 1.0
- MECH 231 NOT OFFERED 2022-2023 Manufacturing Methods F | 4.5
- MECH 217 Measurement in Mechatronics F | 4.25
- MECH 221 Solid Mechanics I F | 3.5
- MECH 230 Applied Thermodynamics I F | 3.5
- MECH 270 Materials Science and Engineering F | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- MECH 203 Mathematical and Computational Tools for Mechanical Engineers II W | K3.5
- MECH 210 Electronic Circuits and Motors for Mechatronics W | K4.5
- MECH 228 Kinematics and Dynamics F/W | K3.5
- MECH 241 Fluid Mechanics I W | 3.5
- MECH 273 Materials Science and Engineering Lab W | 1.0

Minimum Total Credits: 44.25

Students take either MECH 211 and MECH 212, or MECH 213. MECH 213 combines the content of 211 and 212 in a single course.

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

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

Third Year Common Core- 2022-2023

- MECH 302 Mathematical and Computational Tools for Mechanical Engineers III F | K3.5
- MECH 310 Digital Systems for Mechatronics F | K4.5
- MECH 321 Solid Mechanics II F | 3.5
- MECH 328 Dynamics and Vibration F | 3.5
• APSC 221 Economics and Business Practices in Engineering F/W/S | 3
• MECH 323 Machine Design W | 4.5
• MECH 346 Heat Transfer W | 3.5
• MECH 350 Automatic Control W | 3.5

General Sub-Plan (ME1)

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

• MECH 330 Applied Thermodynamics II F | 3.5
• MECH 396 Mechanical and Materials Engineering Laboratory I F | 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)

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

• MECH 393 Biomechanical Product Development W | 3.5
• MECH 396 Mechanical and Materials Engineering Laboratory I F | K2
  or
• MECH 398 Mechanical Engineering Laboratory I F | K2
• MECH 394 Frontiers in Biomechanical Engineering 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- 2023-2024
- Complementary Studies, List A, F or W | 3
- Complementary Studies, List A or B, F or W | 6
- ME1 and ME2 Technical Electives (See Technical Elective List) F and W | 20.5
- ME3 Technical Electives (See Technical Elective List) F and W | 17.0

**Important to Note:** The above list is for a typical fourth year program and may vary depending on choices in previous years. Students must have a minimum total of 9 credits of Complementary Studies electives and a minimum of 27 credits of Technical Electives in the ME1 and ME2 options, and a minimum total of 23.5 credits of Technical Electives in the ME3 option, as detailed below. This count includes any 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: 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
- MECH 464 Communications and Project Management F | 1.5
- MECH 462 Team Project - Implement and Operate W | K3.5

Minimum Total Credits: 38

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

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

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

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

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

Technical Electives

Students are required to complete technical electives dependent on their option, as listed below:

**ME1 Option**

A minimum of 17.0 credits from any combination of courses on Lists 1, 2 or 3

A minimum of 3.5 additional credits from any combination of courses on Lists 1, 2, 3 or 4

**For a minimum total requirement of technical electives of 20.5 credits**

**ME2 Option**

A minimum of 10.0 credits from courses on List 2

A minimum of 7.0 additional credits from any combination of courses on Lists 1, 2 or 3

A minimum of 3.5 additional credits from any combination of courses on Lists 1, 2, 3 or 4

**For a minimum total requirement of technical electives of 23.5 credits**

**ME3 Option**

A minimum of 10.0 credits from courses on List 3

A minimum of 3.5 additional credits from any combination of courses on Lists 1, 2 or 3

A minimum of 3.5 additional credits from any combination of courses on Lists 1, 2, 3 or 4

**For a minimum total requirement of technical electives of 17.0 credits**

(Note that ME3 students are required to take MECH 462 as core, but it is an optional List 1 technical elective for ME1 and ME2 students. Students take the same total load in all three options.)

(As an example, 17.5 from List 1, 2 or 3; 3.0 from List 4 would also satisfy the ME1 requirement.)

For all courses, students must meet the prerequisite requirements and no exclusion courses are allowed. Any exception to the requirements above must be approved by the Undergraduate Chair. It is the sole responsibility of the student to ensure that elective weights are sufficient to meet the total technical elective requirement.

All course availabilities and the term in which a course is held can change from one academic year to the next. This can occur due to curriculum changes, instructor availability or a change in departmental resources. Please refer to the individual course descriptions in the current calendar for further details.

**Mechanical and Materials Engineering: Technical Elective Lists**
Mechanical and Materials Engineering, B.A.Sc. (Class of 2025)

Second Year CORE 2022-2023

- MECH 202 Mathematical and Computational Tools for Mechanical Engineers I F | K3.5
- MECH 211 Manufacturing Methods F | 3.5
- MECH 212 Machine Tool Laboratory F/W | 1.0
- MECH 213 NOT OFFERED 2022-2023 Manufacturing Methods F | 4.5
- MECH 217 Measurement in Mechatronics F | 4.25
- MECH 221 Solid Mechanics I F | 3.5
- MECH 230 Applied Thermodynamics I F | 3.5
- MECH 270 Materials Science and Engineering F | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- MECH 203 Mathematical and Computational Tools for Mechanical Engineers II W | K3.5
- MECH 210 Electronic Circuits and Motors for Mechatronics W | K4.5
- MECH 228 Kinematics and Dynamics F/W | K3.5
- MECH 241 Fluid Mechanics I W | 3.5
- MECH 273 Materials Science and Engineering Lab W | 1.0

Minimum Total Credits: 43.75

Students take either MECH 211 and MECH 212, or MECH 213. MECH 213 combines the content of 211 and 212 in a single course.

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

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

Third Year CORE 2023-2024

- MECH 302 Mathematical and Computational Tools for Mechanical Engineers III F | K3.5
- MECH 310 Digital Systems for Mechatronics F | K4.5
- MECH 321 Solid Mechanics II F | 3.5
- MECH 328 Dynamics and Vibration F | 3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- MECH 323 Machine Design W | 4.5
- MECH 346 Heat Transfer W | 3.5
- MECH 350 Automatic Control W | 3.5

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

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

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

- MECH 393 Biomechanical Product Development W | 3.5
- MECH 396 Mechanical and Materials Engineering Laboratory I F | K2
  OR
- MECH 398 Mechanical Engineering Laboratory I F | K2
- MECH 394 Frontiers in Biomechanical Engineering 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 CORE 2024-2025

- Complementary Studies, List A, F or W | 3
- Complementary Studies, List A or B, F or W | 6
- ME1 and ME2 Technical Electives (See Technical Elective List) F and W | 20.5
- ME3 Technical Electives (See Technical Elective List) F and W | 17.0

Important to Note: The above list is for a typical fourth year program and may vary depending on choices in previous years. Students must have a minimum total of 9 credits of Complementary Studies electives and a minimum of 27 credits of Technical Electives in the ME1 and ME2 options, and a minimum total of 23.5 credits of Technical
Electives in the ME3 option, as detailed below. This count includes any electives taken in a student's 2nd, 3rd and 4th years from the specific lists required for their option which are outlined in the Technical Elective description.

General Sub-Plan (ME1)

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

Minimum Total Credits: 35

Materials Sub-Plan (ME2)

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

Minimum Total Credits: 35

Biomechanical Sub-Plan (ME3)

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

Minimum Total Credits: 38

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

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

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

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

Complementary Studies

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

Technical Electives
Students are required to complete technical electives dependent on their option, as listed below:

**ME1 Option**

A minimum of 17.0 credits from any combination of courses on Lists 1, 2 or 3
A minimum of 3.5 additional credits from any combination of courses on Lists 1, 2, 3 or 4

For a minimum total requirement of technical electives of 20.5 credits

**ME2 Option**

A minimum of 10.0 credits from courses on List 2
A minimum of 7.0 additional credits from any combination of courses on Lists 1, 2 or 3
A minimum of 3.5 additional credits from any combination of courses on Lists 1, 2, 3 or 4

For a minimum total requirement of technical electives of 23.5 credits

**ME3 Option**

A minimum of 10.0 credits from courses on List 3
A minimum of 3.5 additional credits from any combination of courses on Lists 1, 2 or 3
A minimum of 3.5 additional credits from any combination of courses on Lists 1, 2, 3 or 4

For a minimum total requirement of technical electives of 17.0 credits

(Note that ME3 students are required to take MECH 462 as core, but it is an optional List 1 technical elective for ME1 and ME2 students. Students take the same total load in all three options.)

(As an example, 17.5 from List 1, 2 or 3; 3.0 from List 4 would also satisfy the ME1 requirement.)

For all courses, students must meet the prerequisite requirements and no exclusion courses are allowed. Any exception to the requirements above must be approved by the Undergraduate Chair. It is the sole responsibility of the student to ensure that elective weights are sufficient to meet the total technical elective requirement.

All course availabilities and the term in which a course is held can change from one academic year to the next. This can occur due to curriculum changes, instructor availability or a change in departmental resources. Please refer to the individual course descriptions in the current calendar for further details.

Mechanical and Materials Engineering: Technical Elective Lists

**Mechanical and Materials Engineering: Technical Electives**

These lists establish which courses qualify to meet the program elective requirements for each of the academic plans.
List 1: General Mechanical Engineering Electives

These courses provide experiences that are central to the development of General Mechanical Engineering attributes. Lists 1A and 1B are included in List 1 for meeting technical elective requirements.

- APSC 381 Advanced Design and Skills for Innovation W | 3.5
- APSC 400 NOT OFFERED 2022-2023 Technology, Engineering & Management (TEAM) FW* | 3
- APSC 401 Interdisciplinary Projects W | 4.5
- CHEE 490 NOT OFFERED 2022-2023 Polymer Formulations and Processing Technology W | 3.5
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 333 Electric Machines W | 4.25
- MECH 330 Applied Thermodynamics II F | 3.5 (Option core to ME1, and a List 1 Tech for ME2 and ME3)
- MECH 341 Fluid Mechanics II W | 3.5 (Option core to ME1, and a List 1 Tech for ME2 and ME3)
- MECH 361 NOT OFFERED 2022-2023 - Project Based Engineering: Conceive, Design, Implement and Operate W | 3.5
- MECH 370 Principles of Materials Processing F | 3.5 (Option core to ME2, and List 1 to ME1 and ME3)
- MECH 371 Fracture Mechanics and Dislocation Theory W | 3.5 (Option core to ME2, and List 1 to ME1 and ME3)
- MECH 393 Biomechanical Product Development W | 3.5 (Option core to ME3, and a List 1 Tech for ME1 and ME2)
- MECH 394 Frontiers in Biomechanical Engineering F | 3.5 (Option core to ME3, and a List 1 Tech for ME1 and ME2)
- MECH 420 NOT OFFERED 2022-2023 - Vibrations W | 3.5
- MECH 423 Introduction to Microsystems W | 3.5
- MECH 424 NOT OFFERED 2022-2023 - Sustainable Product Design F | 3.5
- MECH 430 NOT OFFERED 2022-2023 - Thermal Systems Design W | 4
- MECH 435 Internal Combustion Engines W | 3.5
- MECH 437 NOT OFFERED 2022-2023 - Fuel Cell Technology F | 3.5
- MECH 439 NOT OFFERED 2022-2023 Turbomachinery W | 3.5
- MECH 441 NOT OFFERED 2022-2023 - Fluid Mechanics III W | 3.5
- MECH 444 Computational Fluid Dynamics F | 3.5
- MECH 448 Compressible Fluid Flow W | 3.5
- MECH 452 NOT OFFERED 2022-2023 - Mechatronics Engineering W | 5
- MECH 455 Computer Integrated Manufacturing F | 3.5
- MECH 456 Introduction to Robotics F | 3.5
- MECH 457 Additive Manufacturing W | 4
- MECH 461 Research Project W | K4
- MECH 462 Team Project - Implement and Operate W | K3.5 (Option core to ME3, and a List 1 Tech for ME1 and ME2)
- MECH 465 Computer-Aided Design F | 3.5
- MECH 480 Airplane Aerodynamics and Performance W | 3.5
- MECH 481 NOT OFFERED 2022-2023 Wind Energy F | 3.5
- MECH 482 NOT OFFERED 2022-2023 - Noise Control W | 3.5

List 1A: Engineering Science
These List 1 courses include substantial Engineering Science content and are staffed by Mechanical and Materials Engineering with licensed Professional Engineers, or EITs, as instructors to meet the requirements of CEAB Appendix 3.

- MECH 492 Biological Fluid Dynamics F | 3.5

**List 1B: Engineering Design**

These List 1 courses include substantial Engineering Design content and are staffed by Mechanical and Materials Engineering with licensed Professional Engineers as instructors to meet the requirements of CEAB Appendix 3.

- MECH 495 Ergonomics and Design F | 3.5

**List 2: Materials Engineering Electives**

- MECH 461 Research Project W | K4
- 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 Nano-Structured Materials F | 3.5
- MECH 483 Nuclear Materials F | 3.5

**List 3: Biomechanical Engineering Electives**

- MECH 461 Research Project W | K4
- CHEE 380 Biochemical Engineering F | 3.5
- CHEE 440 Pharmaceutical Technology W | 3.5
- CHEE 484 NOT OFFERED 2022-2023 Bioremediation W | 3.5
- ELEC 408 NOT OFFERED 2022-2023 Biomedical Signal and Image Processing W | 3
- MECH 465 Computer-Aided Design F | 3.5
- MECH 478 Biomaterials F | 3.5
- MECH 492 Biological Fluid Dynamics F | 3.5
- MECH 494 Kinematics of Human Motion W | 3.5
- MECH 495 Ergonomics and Design F | 3.5
MECH 496 Musculoskeletal Biomechanics F | 3.5

List 4: Multi-Disciplinary Engineering Electives

- ANAT 100 Anatomy of the Human Body F,W,S | 3.0
- APSC 250 NOT OFFERED 2022-2023 Biology Through an Engineering Lens S/OL | K3.5
- CHEE 340 Biomedical Engineering W | 3.5
- CHEE 342 Environmental Biotechnology F | 3.5
- CHEE 370 Deleted - Waste Treatment Processes W | 3.5
- CHEE 371 Mitigation of Industrial Pollution W | 3.5
- CHEE 412 Transport Phenomena W | 3.5
- CHEE 363 Electrochemical Engineering* W | 3.5
- CIVL 371 Groundwater Engineering F | 3.75
- CIVL 372 Water and Wastewater Engineering W | 4
- CIVL 471 Subsurface Contamination F | 4
- CIVL 473 Water Resources System W | 3.75
- ELEC 271 Digital Systems F | 4
- ELEC 274 Computer Architecture W | 4
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- MTHE 212 Linear Algebra W | 3.5
- MTHE 337 Introduction to Operations Research Models W | 3
- MTHE 338 Fourier Methods for Boundary Value Problems W | 3.5
- MTHE 434 NOT OFFERED 2022-2023 - Optimization Theory with Applications to Machine Learning W | 3.5
- MTHE 472 Optimization and Control of Stochastic Systems W | 3.5
- MINE 431 Life-Cycle Assessment for Green Technologies F | 3.5
- MINE 459 Risk and Reliability Analysis for Industrial Asset Management, Health & Safety F | 4
- ENPH 491 NOT OFFERED 2022-2023 - Physics of Nuclear Reactors F | 3.5

Areas of Concentration in Mechanical

Although there is no formal streaming of electives in the Mechanical Engineering Curriculum, the following groupings are provided in order to give students some guidance in areas where they may wish to concentrate their studies.

Aerospace Engineering
• MECH 371 Fracture Mechanics and Dislocation Theory W | 3.5 (Core for ME2 option)
• MECH 437 NOT OFFERED 2022-2023 - Fuel Cell Technology F | 3.5
• MECH 439 NOT OFFERED 2022-2023 Turbomachinery W | 3.5
• MECH 441 NOT OFFERED 2022-2023 - Fluid Mechanics III W | 3.5
• MECH 444 Computational Fluid Dynamics F | 3.5
• MECH 448 Compressible Fluid Flow W | 3.5
• MECH 465 Computer-Aided Design F | 3.5
• MECH 480 Airplane Aerodynamics and Performance W | 3.5
• MECH 481 NOT OFFERED 2022-2023 Wind Energy F | 3.5

Biomechanical Engineering

• CHEE 340 Biomedical Engineering W | 3.5
• MECH 370 Principles of Materials Processing F | 3.5 (Core for ME2 option)
• MECH 371 Fracture Mechanics and Dislocation Theory W | 3.5 (Core for ME2 option)
• MECH 393 Biomechanical Product Development W | 3.5 (Core for ME3 option)
• MECH 394 Frontiers in Biomechanical Engineering F | 3.5 (Core for ME3 option)
• MECH 465 Computer-Aided Design F | 3.5
• MECH 478 Biomaterials F | 3.5
• MECH 492 Biological Fluid Dynamics F | 3.5
• MECH 494 Kinematics of Human Motion W | 3.5
• MECH 495 Ergonomics and Design F | 3.5
• MECH 496 Musculoskeletal Biomechanics F | 3.5

Manufacturing Engineering

• APSC 381 Advanced Design and Skills for Innovation W | K3.5
• MECH 370 Principles of Materials Processing F | 3.5 (Core for ME2 option)
• MECH 424 NOT OFFERED 2022-2023 - Sustainable Product Design F | 3.5
• MECH 455 Computer Integrated Manufacturing F | 3.5
• MECH 457 Additive Manufacturing W | 4
• MECH 462 Team Project - Implement and Operate W | K3.5 (Core for ME3 option)
• MECH 465 Computer-Aided Design F | 3.5
• MECH 476 Engineering of Polymers and Composite Materials W | 3.5
• MECH 482 NOT OFFERED 2022-2023 - Noise Control W | 3.5

Mechatronics Engineering

• ELEC 271 Digital Systems F | 4
• ELEC 274 Computer Architecture W | 4
• ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
• MECH 420 NOT OFFERED 2022-2023 - Vibrations W | 3.5
• MECH 423 Introduction to Microsystems W | 3.5
• MECH 452 NOT OFFERED 2022-2023 - Mechatronics Engineering W | 5
• MECH 455 Computer Integrated Manufacturing F | 3.5
• MECH 456 Introduction to Robotics F | 3.5
• MECH 482 NOT OFFERED 2022-2023 - Noise Control W | 3.5

Energy and Fluid Systems

• MECH 430 NOT OFFERED 2022-2023 - Thermal Systems Design W | 4
• MECH 435 Internal Combustion Engines W | 3.5
• MECH 437 NOT OFFERED 2022-2023 - Fuel Cell Technology F | 3.5
• MECH 439 NOT OFFERED 2022-2023 Turbomachinery W | 3.5
• MECH 441 NOT OFFERED 2022-2023 - Fluid Mechanics III W | 3.5
• MECH 444 Computational Fluid Dynamics F | 3.5
• MECH 448 Compressible Fluid Flow W | 3.5
• MECH 480 Airplane Aerodynamics and Performance W | 3.5
• MECH 481 NOT OFFERED 2022-2023 Wind Energy F | 3.5
• MECH 492 Biological Fluid Dynamics F | 3.5

Materials Engineering

• MECH 370 Principles of Materials Processing F | 3.5 (Core to ME2 option)
• MECH 371 Fracture Mechanics and Dislocation Theory W | 3.5 (Core to ME2 option)
• 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 Nano-Structured Materials F | 3.5
• MECH 483 Nuclear Materials F | 3.5

Mechatronics and Robotics Engineering

Mechatronics and Robotics Engineering (MRE) program addresses the emerging disciplines of mechatronics and robotics engineering, and integrates the traditional disciplines of computer, electrical, and mechanical engineering, with key elements of automatic control, mechanics, electronics, intelligent systems, signal processing and telecommunications systems. This multidisciplinary approach recognizes the ever-increasing complexity of engineering systems, and the societal need for skilled engineers. The MRE program addresses the need for a truly integrated approach to mechatronics and robotics across four years of study. A sequence of experiential project-based design courses will progressively build the students' foundational knowledge and culminate in a capstone design project that could lead to participation in an external design competition. Following a common two years of study (with the first year being direct-entry from high-school), in their third year students can pursue either an electrical or a mechanical stream. In their final year, students will select eight technical electives, with the option of completing one of four recommended concentrations: automation, robotics, biomedical and intelligent systems. This will give them the opportunity to tailor the curriculum to their own interests.
Mechatronics & Robotics Engineering, B.A.Sc. (Class of 2025)

The Mechatronics and Robotics Engineering (MRE) program addresses the emerging disciplines of mechatronics and robotics engineering, and integrates the traditional disciplines of computer, electrical, and mechanical engineering, with key elements of automatic control, mechanics, electronics, intelligent systems, signal processing and telecommunications systems. This multidisciplinary approach recognizes the ever-increasing complexity of engineering systems, and the societal need for skilled engineers. The MRE program addresses the need for a truly integrated approach to mechatronics and robotics across four years of study. A sequence of experiential project-based design courses will progressively build the students’ foundational knowledge and culminate in a capstone design project that could lead to participation in an external design competition. Following a common two years of study (with the first year being direct-entry from high-school), in their third year students can pursue either an electrical or a mechanical stream. In their final year, students will select eight technical electives, with the option of completing one of four recommended concentrations: automation, robotics, biomedical and intelligent systems. This will give them the opportunity to tailor the curriculum to their own interests.

First Year 2021-2022

- MREN 103 Mechatronics Design I W | K4
- MREN 178 Data Structures and Algorithms W | 4
- APSC 101 Engineering Design and Practice F | K3.5
- APSC 102 Experimentation F/W | K2
- APSC 111 Physics I F | 3.3
- APSC 112 Physics II W | 3.3
- APSC 131 Chemistry and Materials F | 3.3
- APSC 143 Introduction to Computer Programming for Engineers F | K3.3
- APSC 162 Engineering Graphics W | 2.5
- APSC 171 Calculus I F | K3.3
- APSC 172 Calculus II W | 3.3
- APSC 174 Introduction to Linear Algebra W, S | 3.3
- APSC 199 English Proficiency for Engineers FW, S | K0.2

Second Year 2022-2023

- MREN 203 Mechatronics Design II W | 4
- MREN 223 Signals and Systems W | 5
- MREN 230 Thermodynamics and Heat Transfer W | 3.75
- MREN 241 Fluid Mechanics and Fluid Power F | 3.75
- ELEC 221 Electric Circuits F | 4.25
- ELEC 252 Electronics I W | 4.25
- ELEC 271 Digital Systems F | 4
- ELEC 274 Computer Architecture W | 4
- MECH 221 Solid Mechanics I F | 3.5
- MECH 228 Kinematics and Dynamics F/W | K3.5
- MTHE 228 Complex Analysis W | 3.5
- MTHE 237 Differential Equations for Engineering Science F | 3.5

Third Year 2023-2024
• APSC 221 Economics and Business Practices in Engineering F/W/S | 3
• MREN 303 Mechatronics Design III W | 4
• MREN 318 Sensors and Electric Actuators F | 5.5
• MREN 320 Automation: Machine Design and Control W | 3.5
• MREN 348 Introduction to Robotics W | 3.5
• ELEC 326 Probability and Random Processes F | 3.5
• ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
• ELEC 372 Numerical Methods and Optimization W | 3.5
• ELEC 353 Electronics II F | 4.25
• ELEC 373 Computer Networks W | 3.5
  
Plus choose one (1) Complementary Studies course.
• MECH 350 Automatic Control W | 3.5

Fourth Year 2024-2025

• MREN 403 Mechatronics Design IV FW | 8
• MREN 410 Intelligent Machines and Autonomous Systems F | 3.5
• Two Complementary Studies (term dictated by timetable)
• Three Free Technical Electives (any course from FEAS calendar, timetable permitting)
• Five Primary Technical Electives (recommended Concentrations below, timetabling guaranteed)

Automation

• ELEC 431 Power Electronics F | 3.25
• ELEC 436 NOT OFFERED 2022-2023 Electric Machines and Control W | 3
• ELEC 474 NOT OFFERED 2022-2023 Machine Vision F | 3.5
• MECH 423 Introduction to Microsystems W | 3.5
• MECH 455 Computer Integrated Manufacturing F | 3.5

Robotics

• ELEC 436 NOT OFFERED 2022-2023 Electric Machines and Control W | 3
• ELEC 444 NOT OFFERED 2022-2023 Modeling and Computer Control of Mechatronic Systems W | 3.25
• ELEC 472 Artificial Intelligence W | 3.5
• ELEC 474 NOT OFFERED 2022-2023 Machine Vision F | 3.5
• MECH 455 Computer Integrated Manufacturing F | 3.5

Biomedical

• ELEC 408 NOT OFFERED 2022-2023 Biomedical Signal and Image Processing W | 3
• MECH 393 Biomechanical Product Development W | 3.5
• MECH 394 Frontiers in Biomechanical Engineering F | 3.5
• MECH 495 Ergonomics and Design F | 3.5
• MECH 496 Musculoskeletal Biomechanics F | 3.5

Intelligent Systems
• ELEC 421 NOT OFFERED 2022-2023 Digital Signal Processing: Filters and System Design F | 4
• ELEC 425 Machine Learning and Deep Learning F | 3.5
• ELEC 472 Artificial Intelligence W | 3.5
• ELEC 474 NOT OFFERED 2022-2023 Machine Vision F | 3.5
• CMPE 325 Human-Computer Interaction W | 3

Mechatronics & Robotics Engineering, B.A.Sc. (Class of 2026)

The Mechatronics and Robotics Engineering (MRE) program addresses the emerging disciplines of mechatronics and robotics engineering, and integrates the traditional disciplines of computer, electrical, and mechanical engineering, with key elements of automatic control, mechanics, electronics, intelligent systems, signal processing and telecommunications systems. This multidisciplinary approach recognizes the ever-increasing complexity of engineering systems, and the societal need for skilled engineers. The MRE program addresses the need for a truly integrated approach to mechatronics and robotics across four years of study. A sequence of experiential project-based design courses will progressively build the students’ foundational knowledge and culminate in a capstone design project that could lead to participation in an external design competition. Following a common two years of study (with the first year being direct-entry from high-school), in their third year students can pursue either an electrical or a mechanical stream. In their final year, students will select eight technical electives, with the option of completing one of four recommended concentrations: automation, robotics, biomedical and intelligent systems. This will give them the opportunity to tailor the curriculum to their own interests.

First Year 2022-2023

• MREN 103 Mechatronics Design I W | K4
• MREN 178 Data Structures and Algorithms W | 4
• APSC 101 Engineering Design and Practice F | K3.5
• APSC 102 Experimentation F/W | K2
• APSC 111 Physics I F | 3.3
• APSC 112 Physics II W | 3.3
• APSC 131 Chemistry and Materials F | 3.3
• APSC 143 Introduction to Computer Programming for Engineers F | K3.3
• APSC 162 Engineering Graphics W | 2.5
• APSC 171 Calculus I F | K3.3
• APSC 172 Calculus II W | 3.3
• APSC 174 Introduction to Linear Algebra W, S | 3.3
• APSC 182 Applied Engineering Mechanics W, F, S | 1.7
• APSC 199 English Proficiency for Engineers FW, S | K0.2

Second Year 2023-2024

• MREN 203 Mechatronics Design II W | 4
• MREN 223 Signals and Systems W | 5
• MREN 230 Thermodynamics and Heat Transfer W | 3.75
• MREN 241 Fluid Mechanics and Fluid Power F | 3.75
• ELEC 221 Electric Circuits F | 4.25
• ELEC 252 Electronics I W | 4.25
• ELEC 271 Digital Systems F | 4
• ELEC 274 Computer Architecture W | 4
- MECH 221 Solid Mechanics I F | 3.5
- MECH 228 Kinematics and Dynamics F/W | K3.5
- MTHE 228 Complex Analysis W | 3.5
- MTHE 237 Differential Equations for Engineering Science F | 3.5

Third Year 2024-2025

- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- MREN 303 Mechatronics Design III W | 4
- MREN 318 Sensors and Electric Actuators F | 5.5
- MREN 320 Automation: Machine Design and Control W | 3.5
- MREN 348 Introduction to Robotics W | 3.5
- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4
- ELEC 372 Numerical Methods and Optimization W | 3.5
- Plus choose one (1) Complementary Studies course.

- ELEC 353 Electronics II F | 4.25
- ELEC 373 Computer Networks W | 3.5
- MECH 350 Automatic Control W | 3.5

Fourth Year 2025-2026

- MREN 403 Mechatronics Design IV FW | 8
- MREN 410 Intelligent Machines and Autonomous Systems F | 3.5
- Two Complementary Studies (term dictated by timetable)
- Three Free Technical Electives (any course from FEAS calendar, timetable permitting)
- Five Primary Technical Electives (recommended Concentrations below, timetabling guaranteed)

Automation

- ELEC 431 Power Electronics F | 3.25
- ELEC 436 NOT OFFERED 2022-2023 Electric Machines and Control W | 3
- ELEC 474 NOT OFFERED 2022-2023 Machine Vision F | 3.5
- MECH 423 Introduction to Microsystems W | 3.5
- MECH 455 Computer Integrated Manufacturing F | 3.5

Robotics

- ELEC 436 NOT OFFERED 2022-2023 Electric Machines and Control W | 3
- ELEC 444 NOT OFFERED 2022-2023 Modeling and Computer Control of Mechatronic Systems W | 3.25
- ELEC 472 Artificial Intelligence W | 3.5
- ELEC 474 NOT OFFERED 2022-2023 Machine Vision F | 3.5
- MECH 455 Computer Integrated Manufacturing F | 3.5

Biomedical
• ELEC 408 NOT OFFERED 2022-2023 Biomedical Signal and Image Processing W | 3
• MECH 393 Biomechanical Product Development W | 3.5
• MECH 394 Frontiers in Biomechanical Engineering F | 3.5
• MECH 495 Ergonomics and Design F | 3.5
• MECH 496 Musculoskeletal Biomechanics F | 3.5

Intelligent Systems

• ELEC 421 NOT OFFERED 2022-2023 Digital Signal Processing: Filters and System Design F | 4
• ELEC 425 Machine Learning and Deep Learning F | 3.5
• ELEC 472 Artificial Intelligence W | 3.5
• ELEC 474 NOT OFFERED 2022-2023 Machine Vision F | 3.5
• CMPE 325 Human-Computer Interaction W | 3

Mining Engineering

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

Options available:

• Mining Option
• Mineral Processing Option
• Mechanical Option

Mining Engineering, B.A.Sc. (Class of 2023)

Second Year Common Core - 2020/2021

• APSC 200 Engineering Design and Practice II F/W | K4
• APSC 221 Economics and Business Practices in Engineering F/W/S | 3
• APSC 293 Engineering Communications I F/W/S | K1
• CIVL 230 Solid Mechanics I F | 4.25
• MINE 201 Introduction to Mining and Mineral Processing F | 4
- CHEE 209 Analysis of Process Data F | 3.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- CHEE 210 Thermodynamics of Energy Conversion Systems W | 3.5
- CIVL 222 Numerical Methods for Civil Engineers W | 5
- MECH 210 Electronic Circuits and Motors for Mechatronics W | K4.5
- MINE 267 Applied Chemistry for Mining W | 3.5
- MINE 268 Analytical Methods in Mining W | 1
- MINE 272 Applied Data Science W | 4.5

Subtotal Credits: 45.25

Mining Option N1

- Complementary Studies, List A W | 3

Subtotal Credits: 3

Minimum Total Credits: 48.25

Minerals Processing Environmental Option N2

- Complementary Studies, List A W | 3

Subtotal Credits: 7.5

Minimum Total Credits: 48.25

Mine-Mechanical Option N3

- MECH 228 Kinematics and Dynamics F/W | K3.5

Subtotal Credits: 3.5

Minimum Total Credits: 48.75

Third Year Common Core - 2021-2022
- MINE 321 Drilling and Blasting F | 4.5
- MINE 325 Applied Rock Mechanics F | 4.5
- MINE 326 Operations Research W | 4.5
- MINE 330 Mineral Industry Economics F | 3.5
- MINE 331 Methods of Mineral Separation F | 4.5
- GEOE 262 Geological Aspects of Mineral Deposits W | 3.75
- MINE 324 DELETED - Hydraulics for Mining Applications W | 3.5
- MINE 341 Open Pit Mining W | 4.5
- MINE 344 Underground Mining W | 4

Subtotal Credits: 36.25

Mining Option N1

- MINE 339 Mine Ventilation W | 4.5
- Mining Elective List A W | 3
- Mining Elective List A or B W | 3

Subtotal Credits: 10.5

Minimum Total Credits: 46.75

Minerals Processing Environmental Option N2
- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 319 Process Dynamics and Control W | 3.5
- Mining Elective List A W | 3

Subtotal Credits: 10

Minimum Total Credits: 46.25

Mine-Mechanical Option N3

- MECH 328 Dynamics and Vibration F | 3.5
- MECH 323 Machine Design W | 4.5
- MECH 350 Automatic Control W | 3.5

Subtotal Credits: 11.5

Minimum Total Credits: 47.75

Fourth Year Common Core - 2022/2023

- MINE 422 Mining and Sustainability F | 4
- MINE 431 Life-Cycle Assessment for Green Technologies F | 3.5
- Mining Elective List A or B W | 3
- Complementary Studies List A or B W | 3
- MINE 459 Risk and Reliability Analysis for Industrial Asset Management, Health & Safety F | 4

Subtotal Credits: 17.50

Mining Option N1
• MINE 467 Geostatistics and Orebody Modelling F | 4.5
• Mining Elective List A or B W | 3
• MINE 445 Open Pit Mine Design W | 5.5
• MINE 448 Underground Design W | 5.5

Subtotal Credits: 18.50

Minimum Total Credits: 36

Minerals Processing Environmental Option N2

• MINE 451 Chemical Extraction of Metals F | 4
• MINE 455 Design, Analysis and Operation of Mineral Processes F | 4.5
• Mining Elective List A W|3
• MINE 458 Process Investigations W | 4
• Mining Elective List A or B W | 3

Subtotal Credits: 18.50

Minimum Total Credits: 35

Mine-Mechanical Option N3
- MINE 339 Mine Ventilation W | 4.5
- MINE 471 Mine-Mechanical Design Project W | 5.5
- Complementary Studies, List A F | 3
- Mining Elective List A or B F | 3
- Mining Elective List A F | 3
- Mining Elective List A or B W | 3

Subtotal Credits: 22

Minimum Total Credits: 39.5

Elective requirements

Students in all options (N1-Mine-Mine, N2-Mineral Processing Environmental, N3-Mine-Mechanical) must take a minimum of four courses from the approved Elective lists.

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 course is APSC 293. Included in the core Mining program is an additional 2.0 credits of Linkage in MINE 459. In addition to this core content, Mining students must take at least 6 additional credits of Complementary Studies, of which at least 3 credits must be from List A and the remaining 3 credits can be from List A or B.

Mining Engineering, B.A.Sc. (Class of 2024)

Second Year Common Core - 2021-2022

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- APSC 293 Engineering Communications I F/W/S | K1
- CHEE 209 Analysis of Process Data F | 3.5
- CIVL 230 Solid Mechanics I F | 4.25
- MINE 201 Introduction to Mining and Mineral Processing F | 4
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- CHEE 210 Thermodynamics of Energy Conversion Systems W | 3.5
- CIVL 222 Numerical Methods for Civil Engineers W | 5
- MECH 210 Electronic Circuits and Motors for Mechatronics W | K4.5
- MINE 267 Applied Chemistry for Mining W | 3.5
- MINE 268 Analytical Methods in Mining W | 1
• MINE 272 Applied Data Science W | 4.5

Subtotal Credits: 45.25

Mining Option N1

• Complementary Studies, List A W | 3

Subtotal Credits: 3

Minimum Total Credits: 48.25

Minerals Processing Environmental Option N2

• Complementary Studies, List A W | 3

Subtotal Credits: 3

Minimum Total Credits: 48.25

Mine-Mechanical Option N3

• MECH 228 Kinematics and Dynamics F/W | K3.5

Subtotal Credits: 3.5

Minimum Total Credits: 48.75

Third Year Common Core - 2022-2023

• MINE 321 Drilling and Blasting F | 4.5
• MINE 325 Applied Rock Mechanics F | 4.5
• MINE 326 Operations Research W | 4.5
• MINE 330 Mineral Industry Economics F | 3.5
• MINE 331 Methods of Mineral Separation F | 4.5
• GEOE 262 Geological Aspects of Mineral Deposits W | 3.75
• MINE 341 Open Pit Mining W | 4.5
• MINE 344 Underground Mining W | 4
• MREN 241 Fluid Mechanics and Fluid Power F | 3.75

Subtotal Credits: 37.5

Mining Option N1

• MINE 339 Mine Ventilation W | 4.5
• Elective F | 3
- Elective W | 3

Subtotal Credits: 10.5

Minimum Total Credits: 48

Minerals Processing Environmental Option N2

- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 319 Process Dynamics and Control W | 3.5
- Elective W | 3

Subtotal Credits: 10

Minimum Total Credits: 47.5

Mine-Mechanical Option N3

- MECH 328 Dynamics and Vibration F | 3.5
- MECH 323 Machine Design W | 4.5
- MECH 350 Automatic Control W | 3.5

Subtotal Credits: 11.5

Minimum Total Credits: 49

Fourth Year Common Core - 2023-2024

- MINE 422 Mining and Sustainability F | 4
- MINE 431 Life-Cycle Assessment for Green Technologies F | 3.5
  - Elective W | 3
  - Complementary Studies List A or B W | 3
- MINE 459 Risk and Reliability Analysis for Industrial Asset Management, Health & Safety F | 4

Subtotal Credits: 17.50

Mining Option N1

- MINE 467 Geostatistics and Orebody Modelling F | 4.5
- Elective F | 3
- MINE 445 Open Pit Mine Design W | 5.5
- MINE 448 Underground Design W | 5.5

Subtotal Credits: 18.5

Minimum Total Credits: 36
Minerals Processing Environmental Option N2

- MINE 451 Chemical Extraction of Metals F | 4
- MINE 458 Process Investigations W | 4
- Elective W | 3
- Elective W | 3

Subtotal Credits: 18.5

Minimum Total Credits: 36

Mine-Mechanical Option N3

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

Subtotal Credits: 22

Minimum Total Credits: 39.50

Elective requirements

Students in all options (N1-Mine-Mine, N2-Mineral Processing Environmental, N3-Mine-Mechanical) must take a minimum of four courses from the approved Elective lists.

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 course is APSC 293. Included in the core Mining program is an additional 2.0 credits of Linkage in MINE 459. In addition to this core content, Mining students must take at least 6 additional credits of Complementary Studies, of which at least 3 credits must be from List A and the remaining 3 credits can be from List A or B

Mining Engineering, B.A.Sc. (Class of 2025)
Second Year Common Core - 2022-2023

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W/S | K1
- CHEE 209 Analysis of Process Data F | 3.5
- CIVL 230 Solid Mechanics I F | 4.25
- MECH 228 Kinematics and Dynamics F/W | K3.5
- MINE 201 Introduction to Mining and Mineral Processing F | 4
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- CHEE 210 Thermodynamics of Energy Conversion Systems W | 3.5
- CIVL 222 Numerical Methods for Civil Engineers W | 5
- MECH 210 Electronic Circuits and Motors for Mechatronics W | K4.5
- MINE 267 Applied Chemistry for Mining W | 3.5
- MINE 268 Analytical Methods in Mining W | 1
- MINE 272 Applied Data Science W | 4.5

Subtotal Credits: 45.75

Third Year Common Core - 2023-2024

- MINE 321 Drilling and Blasting F | 4.5
- MINE 325 Applied Rock Mechanics F | 4.5
- MINE 326 Operations Research W | 4.5
- MINE 330 Mineral Industry Economics F | 3.5
- MINE 331 Methods of Mineral Separation F | 4.5
- GEOE 262 Geological Aspects of Mineral Deposits W | 3.75
- MINE 341 Open Pit Mining W | 4.5
- MINE 344 Underground Mining W | 4
- MREN 241 Fluid Mechanics and Fluid Power F | 3.75

Subtotal Credits: 37.5

Mining Option N1
- MINE 339 Mine Ventilation W | 4.5
- Mining Elective F | 3
- Mining Elective W | 3

Subtotal Credits: 10.5

Minimum Total Credits: 48

Minerals Processing Environmental Option N2

- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 319 Process Dynamics and Control W | 3.5
- Mining Elective W | 3

Subtotal Credits: 10

Minimum Total Credits: 47.5

Mine-Mechanical Option N3

- MECH 328 Dynamics and Vibration F | 3.5
- MECH 323 Machine Design W | 4.5
- MECH 350 Automatic Control W | 3.5

Subtotal Credit: 11.5

Minimum Total Credits: 49
Fourth Year Common Core - 2024-2025

- MINE 422 Mining and Sustainability F | 4
- MINE 431 Life-Cycle Assessment for Green Technologies F | 3.5
- MINE 459 Risk and Reliability Analysis for Industrial Asset Management, Health & Safety F | 4
- Mining Elective W | 3.5
- Complementary Studies List A or B W | 3
- Complementary Studies List A F | 3

Subtotal Credit: 20.5

Mining Option N1

- MINE 467 Geostatistics and Orebody Modelling F | 4.5
- Mining Elective List A F | 3
- MINE 445 Open Pit Mine Design W | 5.5
- MINE 448 Underground Design W | 5.5

Subtotal Credits: 18.5

Minimum Total Credits: 39

Minerals Processing Environmental Option N2

- MINE 451 Chemical Extraction of Metals F | 4
- MINE 458 Process Investigations W | 4
- Mining Elective W | 3
- Mining Elective W | 3

Subtotal Credits: 18.5

Minimum Total Credits: 39

Mine-Mechanical Option N3
- MINE 339 Mine Ventilation W | 4.5
- MINE 471 Mine-Mechanical Design Project W | 5.5
- Mining Elective F | 3
- Mining Elective F | 3
- Mining Elective W | 3

Subtotal Credits: 19

Minimum Total Credits: 39.50

Elective Requirements

Students in all options (N1-Mine-Mine, N2-Mineral Processing Environmental, N3-Mine-Mechanical) must take a minimum of four courses from the approved Elective lists.

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 course is MINE 330. The Communications course is APSC 293. Included in the core Mining program is an additional 2.0 credits of Linkage in MINE 459. In addition to this core content, Mining students must take at least 6 additional credits of Complementary Studies, of which at least 3 credits must be from List A and the remaining 3 credits can be from List A or B

Mining Engineering: Electives

Elective Requirements

Students in all three options (N1, N2, N3) must take a minimum of 12 credits of Elective courses from the approved Elective list.

Of these 12 credits, at least 6 credits must be from the relevant Mining Electives List A (-N1, -N2, or –N3). The remaining credits can be from Mining Electives List B, or also from the relevant Mining Electives List A (-N1, -N2, or –N3).

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 Complementary Studies 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 Electives List A - N1

- APSC 250 NOT OFFERED 2022-2023 Biology Through an Engineering Lens S/OL | K3.5
- CHEE 319 Process Dynamics and Control W | 3.5
- MECH 350 Automatic Control W | 3.5
- MNTC P07 Surveying Principles O/L | 3
- MNTC 415 Metal Extraction Processes O/L | 4
- MNTC 418 Sustainability and the Environment O/L | 3
- MNTC 419 Mine Supervision and Project Management O/L | 3
- MNTC 423 Geomatics O/L | 3
- LAW 204 Corporate Law
- MINE 451 Chemical Extraction of Metals F | 4

Mining Electives List A - N2

- APSC 250 NOT OFFERED 2022-2023 Biology Through an Engineering Lens S/OL | K3.5
- LAW 204 Corporate Law
- MNTC P07 Surveying Principles O/L | 3
- MNTC 311 Ore Body Modelling and Resource Estimation O/L | 4.5
- MNTC 316 Ventilation and Hydraulics O/L | 4
- MNTC 413 Surface Mine Planning O/L | 4
- MNTC 414 Underground Mine Planning O/L | 4
- MNTC 418 Sustainability and the Environment O/L | 3
- MNTC 419 Mine Supervision and Project Management O/L | 3
- MNTC 423 Geomatics O/L | 3

Mining Electives List A - N3

- APSC 250 NOT OFFERED 2022-2023 Biology Through an Engineering Lens S/OL | K3.5
- LAW 204 Corporate Law
- MINE 451 Chemical Extraction of Metals F | 4
- MNTC P07 Surveying Principles O/L | 3
- MNTC 311 Ore Body Modelling and Resource Estimation O/L | 4.5
- MNTC 415 Metal Extraction Processes O/L | 4
- MNTC 418 Sustainability and the Environment O/L | 3
- MNTC 419 Mine Supervision and Project Management O/L | 3
- MNTC 423 Geomatics O/L | 3

Mining Electives List B

- MINE 300 series Any 3rd-year non-core mining course offered by the mining department
- MINE 400 series Any 4th-year non-core mining course offered by the mining department
- MINE 800 series Any graduate mining course offered by the mining department and with approval of the School of Graduate Studies
- Languages Any language course from List "A" and List "C" selections. Note: Student's language skills will be evaluated prior to the approval of any language course.
- APSC 250 NOT OFFERED 2022-2023 Biology Through an Engineering Lens S/OL | K3.5
- APSC 303 Professional Internship | 3.5
- APSC 400 NOT OFFERED 2022-2023 Technology, Engineering & Management (TEAM) FW* | K7
- APSC 480 NOT OFFERED 2022-23 - Multi-disciplinary Industry Engineering Design Project FW | K9
- CHEE 302 Technical Entrepreneurship W/OL, F/OL | K3.5
- CHEE 310 Deleted-Engineering Innovation and Entrepreneurship F | 3.5
- CHEE 323 Industrial Catalysis W | 3.5
- CHEE 330 Heat and Mass Transfer F | 3.5
- CHEE 342 Environmental Biotechnology F | 3.5
- CHEE 363 Electrochemical Engineering* W | 3.5
- CHEE 371 Mitigation of Industrial Pollution W | 3.5
- CHEE 380 Biochemical Engineering F | 3.5
- CHEE 412 Transport Phenomena W | 3.5
- CHEE 414 Foundations of the Oil and Gas Industry W | K3.5
- CHEE 418 Strategies for Process Investigations F | 3.5
- CHEE 434 NOT OFFERED 2022-2023 Process Control II W | 3.5
- CHEE 460 Applied Surface and Colloid Science F | 3.5
- CIVL 215 Materials for Civil Engineers W | 4.5
- CIVL 340 Geotechnical Engineering I F | 3.75
- CIVL 341 Geotechnical Engineering II W | 4
- CIVL 371 Groundwater Engineering F | 3.75
- CIVL 471 Subsurface Contamination F | 4
- 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 305 Introduction to Entrepreneurship 3
- COMM 310 Environmental Accounting 3
- COMM 322 Financial Management: Strategy 3
- COMM 323 Corporate Financial Planning 3
- COMM 324 Investment and Portfolio Management 3
- COMM 325 Financial Modelling 3
- COMM 328 International Finance 3
- COMM 351 Leadership 3
- COMM 353 Managing Across Cultures 3
- COMM 357 Interpersonal Skills for Managers 3
- COMM 359 Power and Organizational Politics 3
- COMM 375 International Business 3
- COMM 381 Business Law I 3
- COMM 382 Business Law II 3
- COMM 408 Sustainability Strategies and Practices 3
• COMM 409 Sustainability Measurement, Implementation and Evaluation 3
• COMM 495 Project Management 3
• ECON 110 Principles of Economics 6
• ECON 111 Introductory Microeconomics 3
• ECON 112 Introductory Macroeconomics 3
• ECON 239 Economic Development F | 3
• ECON 240 Canadian Tax Policy W | 3
• ECON 261 Canadian Labour Relations F | 3
• ECON 290 Environmental Economics and Assessment F | 3
• 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
• ELEC 274 Computer Architecture W | 4
• ELEC 278 Fundamentals of Information Structures F | 4
• ELEC 280 Fundamentals of Electromagnetics W | 3.75
• ELEC 333 Electric Machines W | 4.25
• ELEC 431 Power Electronics F | 3.25
• ENSC 201 Environmental Toxicology and Chemical Risks W
• ENSC 301 Environmental Assessment W
• ENSC 305 Social Environments W
• ENSC 321 Environmental Justice in Global Context F
• ENSC 390 Sustainability W
• GEOE 221 Geological Engineering Field Methods F | 5
• GEOE 249 Geophysical Characterization of the Earth W | 3.5
• GEOE 319 Applied Geophysics W | 4.5
• GEOE 333 Terrain Evaluation W | 4
• GEOE 365 Geochemical Characterization of the Earth F | 4
• GEOE 463 Spatial Information Management in the Geosciences F | 3.5
• GEOE 475 Exploration and Environmental Geochemistry F | 4.3
• GEOE 481 Structural Analysis Applied to Resource Deposits W | 3.5
• GPHY 242 Remote Sensing I: Image Interpretation and Measurement 3-0-0 3
• GPHY 243 Geographic Information Science 3-0-2 4
• GPHY 304 Arctic and Periglacial Environments W | 3
• GPHY 312 Watershed Hydrology 3-0-3 4.5
• GPHY 342 Remote Sensing II: Digital Image Processing 2-0-0 2
• GPHY 345 Spatial Analysis 2-2-0 4
• GPHY 346 Environmental Modeling 2-2-0 4
• GPHY 351 Aboriginal Geographies of Canada 3-0-0 3
• LAW 201 Introduction to Canadian Law
• LAW 207 International Law
• LAW 202 Aboriginal Law
• LAW 203 Workplace Law
• Law 206 Intellectual Property Law
• MECH 270 Materials Science and Engineering F | 3.5
• MECH 323 Machine Design W | 4.5
• MECH 370 Principles of Materials Processing F | 3.5
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.
• MNTC P04 Calculus O/L | 3
• MNTC P05 Foundational Physics O/L | 3
• MNTC P06 Foundational Chemistry O/L | 3
• MNTC P07 Surveying Principles O/L | 3

Third Year Curriculum

• APSC 199 English Proficiency for Engineers FW, S | K0.2
• APSC 221 Economics and Business Practices in Engineering F/W/S | 3
• MNTC 301 Technical Writing and Communication O/L | 3
• MNTC 302 Engineering Physics O/L | 3
• MNTC 303 Engineering Chemistry O/L | 3
• MNTC 304 Applied Metrology and Data Analysis O/L | 3
• MNTC 305 Introduction to Mining O/L | 4
• MNTC 306 Mineral Processing Unit Operations O/L | 3
• MNTC 307 Geomechanics and Ground Control O/L | 4
• MNTC 310 Mining and Society O/L | 3
• MNTC 313 Introduction to Programming O/L | 3
• MNTC 314 Drilling and Blasting O/L | 4
• MNTC 316 Ventilation and Hydraulics O/L | 4
• MNTC 399 Field School I (on site) S | 5

Fourth Year Curriculum

• MNTC 311 Ore Body Modelling and Resource Estimation O/L | 4.5
• LAW 204 Corporate Law
• MNTC 408 Mine Health and Safety O/L | 3
• MNTC 409 Mineral Economics O/L | 3.5
• MNTC 413 Surface Mine Planning O/L | 4
• MNTC 414 Underground Mine Planning O/L | 4
• MNTC 415 Metal Extraction Processes O/L | 4
• MNTC 418 Sustainability and the Environment O/L | 3
• MNTC 419 Mine Supervision and Project Management O/L | 3
• MNTC 420 Physical Asset Management O/L | 3
• MNTC 423 Geomatics O/L | 3
• MNTC 498 Capstone Project O/L | 3
• MNTC 499 Field School II (on site) S | 5

Complementary Studies

Complementary studies include humanities, social sciences, arts, management, engineering economics and communications that complement the technical content of the curriculum. While considerable latitude is provided in the choice of suitable content for the complementary studies component of the curriculum, some areas of study are essential in the education of an engineer. Accordingly, the curriculum must include studies in the following:

a. Subject matter that deals with the humanities and social sciences

b. Oral and written communications
Language instruction may be included within complementary studies provided it is not taken to fulfill an admission requirement.

In all academic plans in the Faculty students must complete courses in Complementary Studies amounting to at least 18.75 credits (corresponding to 225 AUs, which is the minimum CEAB requirement). Some of these credits are obtained in faculty-wide core courses, while others may be drawn from a list of elective courses. 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.

The table below shows the credits available in the core courses (minimum number of total credits available: 11.17, see Table 1). The rest of the units must be drawn from Lists A and B of elective courses to fulfill the 18.75 credit requirement. Students must thus take a minimum of 3 credits in Humanities and Social Sciences from List A, and an additional 6 credits from List A or B.

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.

Table 1: Complementary Studies content in FEAS programs

<table>
<thead>
<tr>
<th>Area of Complementary Study</th>
<th>Core APSC Courses</th>
<th>Credits in core APSC courses</th>
<th>Minimum credits in various academic plans$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humanities and Social Science (H&amp;SS)</td>
<td>N/A</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Engineering Economics</td>
<td>APSC 221$^1$</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Communications, Impact of engineering on Society, Professionalism</td>
<td>APSC 100, APSC 293, APSC 200, APSC 151, APSC 199</td>
<td>6.67</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Total 11.17 Credits</strong></td>
<td></td>
<td><strong>9.67</strong></td>
<td><strong>1.5</strong></td>
</tr>
</tbody>
</table>

$^1$Note: 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.

$^2$Note: 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.

**IMPORTANT:** Note it is always the student’s responsibility to check that they have the total required number of units.

These Complementary Studies requirements are effective starting the 2020-2021 academic year. For previous years' requirements, please refer to the respective calendar.
**List A and B:**

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

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.

**List A**

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.

**Art History**

<table>
<thead>
<tr>
<th>ARTH Levels 1-3</th>
<th>ARTH 1XX-3XX (except ARTH 245, ARTH 380, ARTH 395)</th>
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**Bader College courses (online)**

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<thead>
<tr>
<th>BADR 100</th>
<th>Thinking Locally</th>
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<tr>
<td>BADR 101</td>
<td>Acting Globally</td>
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**Classical Studies**

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<th>CLST Levels 1-2</th>
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<tbody>
<tr>
<td>CLST 321</td>
<td>World Of Late Antiquity</td>
</tr>
<tr>
<td>CLST 332</td>
<td>The Iron Age to the End of the Persian Wars</td>
</tr>
<tr>
<td>CLST 333</td>
<td>The Rise of the Athenian Empire to the End of the Peloponnesian War</td>
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<td>CLST 334</td>
<td>Fourth Century Greece to the Death of Alexander</td>
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<td>CLST 335</td>
<td>The Hellenistic Successor Kingdoms to the Death of Cleopatra</td>
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<tr>
<td>CLST 340</td>
<td>The Roman Republic</td>
</tr>
<tr>
<td>CLST 341</td>
<td>The Roman Empire</td>
</tr>
<tr>
<td>CLST 343</td>
<td>The Later Roman Empire</td>
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<tr>
<td>CLST 350</td>
<td>Greek Perspectives on Ethnicity and Indigeneity</td>
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**Commerce**
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<tr>
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<tr>
<td>COMM 251</td>
<td>Organizational Behaviour</td>
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<td>COMM 651</td>
<td>Organizational Behaviour</td>
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<tr>
<td><strong>Creative Writing</strong></td>
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<tr>
<td>CWRI 295</td>
<td>Introduction to Creative Writing in Short Fiction &amp; Poetry</td>
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<tr>
<td>CWRI 397</td>
<td>The Literary Screenplay</td>
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<tr>
<td><strong>Global Developmental Studies</strong></td>
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<tr>
<td>DEVS 100</td>
<td>Canada and the “Third World”</td>
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<td>DEVS 220</td>
<td>Introduction to Indigenous Studies</td>
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<tr>
<td>DEVS 221</td>
<td>Topics in Indigenous Human Ecology</td>
<td>3.00</td>
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<tr>
<td>DEVS 230</td>
<td>The Global Political Economy of Development</td>
<td>3.00</td>
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<td>DEVS 240</td>
<td>Culture and Development</td>
<td>3.00</td>
</tr>
<tr>
<td>DEVS 260</td>
<td>Globalization, Gender &amp; Development</td>
<td>3.00</td>
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<td>DEVS 280</td>
<td>Global Engagement</td>
<td>3.00</td>
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<tr>
<td>DEVS 352</td>
<td>Technology and Development</td>
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<tr>
<td><strong>Drama</strong></td>
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<tr>
<td>DRAM 100</td>
<td>Introduction to Theatre</td>
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<tr>
<td>DRAM 200</td>
<td>Theatre History &amp; Literature I</td>
<td>6.00</td>
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<tr>
<td>DRAM 205</td>
<td>Theatricality and Mass Media</td>
<td>3.00</td>
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<tr>
<td>DRAM 211</td>
<td>Introduction to Theatre for Young Audiences</td>
<td>3.00</td>
</tr>
<tr>
<td>DRAM 220</td>
<td>Play Reading and Analysis</td>
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<tr>
<td>DRAM 236</td>
<td>Public Presentation</td>
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<tr>
<td>DRAM 251</td>
<td>Introduction to Playwriting</td>
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<tr>
<td>DRAM 273</td>
<td>Medieval Drama Performance</td>
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<tr>
<td>DRAM 300</td>
<td>Theatre History &amp; Literature II</td>
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<td>DRAM 301</td>
<td>Theories of the Theatre I</td>
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<tr>
<td>DRAM 303</td>
<td>Indigenous Playwrights</td>
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<tr>
<td>DRAM 306</td>
<td>Canadian Drama</td>
<td>3.00</td>
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<tr>
<td><strong>Economics</strong></td>
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<tr>
<td>ECON 110</td>
<td>Principles of Economics</td>
<td>6.00</td>
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</table>
ECON 111  Introductory Microeconomics  3.00
ECON 112  Introductory Macroeconomics  3.00
ECON Level 2  ECON 2XX (Except ECON 250, ECON 255)

**Employment Relations**

EMPR Levels 1-2  EMPR 1XX-2XX

**English**

ENGL 100  Introduction to Literary Study  6.00
ENGL 160  Modern Prose Fiction  6.00
ENGL 2XX  ENG 2XX

**Environmental Science**

ENSC 290  Introduction to Ecological Economics  3.00
ENSC 305  Social Environments  3.00
ENSC 310  Environmental Policy  3.00
ENSC 311  Applied Environmental Policy  3.00
ENSC 315  Global Food Security, Agriculture, and Environment  3.00
ENSC 321  Environmental Justice in Global Context  3.00
ENSC 420  Gender and Environments  3.00

**Film**

FILM 110  Film, Media and Screen Cultures  6.00
FILM 210  The Horror Film  3.00
FILM 214  Mobile Communications  3.00
FILM 215  Science Fiction Cinema  3.00
FILM 220  Disney Pixar DreamWorks  3.00
FILM 225  The Comedy Film  3.00
FILM 236  Media and Cultural Studies  3.00
FILM 240  Media & Popular Culture  3.00
FILM 260  Digital Media Theory and Practice  3.00

**French**

FREN 241  Histoire culturelle et littéraire de l'Ancien Régime  3.00
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<tr>
<td>FREN 285</td>
<td>Cinéma et société: aspects culturels de la francophonie</td>
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<td>FREN 3XX</td>
<td>FREN 3XX (Except FREN 320, 331, 353, 360, 393)</td>
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**Gender Studies**

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<tr>
<td>GNDS</td>
<td>GNDS 1XX-3XX (Levels 1-3)</td>
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**Geography**

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<tr>
<td>GPHY 203</td>
<td>Water Resources and Management</td>
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<td>GPHY 204</td>
<td>Forests as a Global Resource</td>
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<td>GPHY 227</td>
<td>Cities: Geography, Planning and Urban Life</td>
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<td>GPHY 228</td>
<td>Geography of the Global Political Economy</td>
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<tr>
<td>GPHY 229</td>
<td>Place, Space, Culture and Social Life</td>
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<tr>
<td>GPHY 230</td>
<td>Introduction to Urban and Regional Planning</td>
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<tr>
<td>GPHY 250</td>
<td>The Geography of Canada</td>
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<tr>
<td>GPHY 254</td>
<td>The Caribbean in Globalizing World</td>
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<td>GPHY 257</td>
<td>The Geography of Middle America</td>
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<td>GPHY 258</td>
<td>The Geography of South America</td>
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<tr>
<td>GPHY 320</td>
<td>Energy and Society</td>
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<td>GPHY 325</td>
<td>Maps and Society</td>
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<td>GPHY 327</td>
<td>The Geographical Imagination</td>
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<td>GPHY 330</td>
<td>Transportation Geography</td>
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<td>GPHY 362</td>
<td>Human Migration</td>
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**German**

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<td>GRMN 308</td>
<td>Topics in Cultural History I</td>
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<td>GRMN 309</td>
<td>Topics in Cultural History II</td>
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<td>GRMN 311</td>
<td>German Culture through Stories - 18th &amp; 19th Century</td>
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<td>GRMN 312</td>
<td>Culture Through Stories in the 20th and 21st Century</td>
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**Health**

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<td>HLTH 101</td>
<td>Social Determinants of Health</td>
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<td>HLTH 237</td>
<td>Introduction to Drugs, Drug Use and Drug Dependence</td>
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<tr>
<td>HLTH 305</td>
<td>Fundamentals of Health Policy</td>
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<tr>
<td>Course Code</td>
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<tr>
<td>-------------</td>
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</tr>
<tr>
<td>HLTH 332</td>
<td>Foundations for Understanding Disability: A Health Perspective</td>
<td>3.00</td>
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<td>HLTH 350</td>
<td>Topics in Global Health</td>
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<tr>
<td>HLTH 403</td>
<td>Community Based Rehabilitation</td>
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<tr>
<td>HLTH 404</td>
<td>Global Studies of Social Inclusion, Community Participation and Mental Illness</td>
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<td>Hebrew</td>
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<tr>
<td>HEBR 292</td>
<td>Intermediate Biblical Hebrew</td>
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<td>HEBR 393</td>
<td>Reading Modern Hebrew Literature</td>
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<td>History</td>
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<td>HIST</td>
<td>HIST 1XX-2XX (Except HIST 257)</td>
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<tr>
<td>Innovation and Entrepreneurship</td>
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<td>ENIN 301</td>
<td>Creative Entrepreneurship</td>
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<td>ENIN 340</td>
<td>Topics in Innovation and Entrepreneurship</td>
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<td>Interdisciplinary Studies</td>
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<tr>
<td>IDIS 199</td>
<td>The Science of Mental Health, Well-being, and Resiliency</td>
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<td>IDIS 210</td>
<td>Arts in Society</td>
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<tr>
<td>IDIS 220</td>
<td>Hacking the Humanities: An Introduction to the Digital Humanities</td>
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<tr>
<td>IDIS 280</td>
<td>Interprofessional Approaches in Healthcare</td>
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<td>IDIS 302</td>
<td>Race and Racism</td>
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<td>IDIS 303</td>
<td>Mathematics and Poetry</td>
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<td>British Studies I</td>
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<td>INTS 306</td>
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<td>INTS 307</td>
<td>Intercultural Relations</td>
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<td>Urban Images: Race, Gender, Sexuality and the Imagined City</td>
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<td>LLCU</td>
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<td>LAW 203</td>
<td>Workplace Law</td>
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<td>LAW 204</td>
<td>Corporate Law</td>
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<td>LAW 205</td>
<td>Public &amp; Constitutional Law</td>
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<td>LAW 206</td>
<td>Intellectual Property</td>
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<td>LAW 207</td>
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<td>LIBS 100</td>
<td>Origins and Practices of Liberal Arts</td>
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<td>LING 100</td>
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<td>Language and Power</td>
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<tr>
<td>LING 210</td>
<td>Language Acquisition and Learning</td>
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<td>MUSC 102</td>
<td>Western Music: Napoleon to 9/11</td>
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<td>MUSC 114</td>
<td>Introduction to Teaching Music to Children</td>
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<td>MUSC 171</td>
<td>Social History of Popular Music</td>
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<td>MUSC 210</td>
<td>Western Art Music: Crusades to Colonialism</td>
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<td>Western Art Music: Industrialization to the Internet</td>
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<td>MUSC 240</td>
<td>Music of Video Games</td>
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<td>MUSC 241</td>
<td>Scandals that Rocked the Classical Music World</td>
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<td>MUSC 286</td>
<td>Women, Gender and Music</td>
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<td>Global Musics</td>
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<td>MUSC 393</td>
<td>Music and Digital Media</td>
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<td>MUSC 490</td>
<td>Gender and Popular Music</td>
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<td>MUSC 491</td>
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<td>MUTH 110</td>
<td>The Republic to Rationalism: History, Arts, and Performance I</td>
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<td>MUTH 111</td>
<td>Listening to Revolutions: History, Arts, and Performance II</td>
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<td>Sex and Violence in Performance</td>
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<td>MUTH 240</td>
<td>Digital Disruption in the Creative and Performing Arts</td>
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<td>MUTH 251</td>
<td>Issues in Music Theatre</td>
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<td>PHIL</td>
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<td>PSYC 100</td>
<td>Principles of Psychology</td>
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<td>Cognitive Psychology</td>
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<td>PSYC 241</td>
<td>Social Psychology</td>
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<td>PSYC 251</td>
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<td>SOCY 122</td>
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<td>SOCY</td>
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**List B (Professional Issues, Performance Arts and Languages, Management, Business and Law Courses)**
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<th>Course Code</th>
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<td>Anishinaabe</td>
<td>ANSH 101</td>
<td>Beginning Anishinaabe Language and Culture I</td>
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<td></td>
<td>ANSH 102</td>
<td>Beginning Anishinaabe Language and Culture II</td>
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<tr>
<td>Engineering and Applied Science</td>
<td>APSC 223</td>
<td>Global Project Management</td>
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<td>APSC 303</td>
<td>Professional Internship (*Not applicable for CMPE/ELEC students)</td>
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<td></td>
<td>CHEE 302</td>
<td>Technical Entrepreneurship</td>
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<tr>
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<td>MECH 333</td>
<td>Gender, Engineering and Technology</td>
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<td>MNTC 409</td>
<td>Mineral Economics</td>
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<tr>
<td>Arabic</td>
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**Linguistics**

LING 1XX-2XX

**Mohawk**

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**Music**

*(Maximum of two out of MUSC 100/200/300/400)*

*(Maximum of two out of MUSC 112/212/312/412)*

*(Maximum of two out of MUSC 115/215/315/415)*

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**Sociology**

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Urban Planning
SURP 853  Environmental Services  3.00

Courses of Instruction

APSC 100 NOT OFFERED 2022-2023 - Engineering Practice I FW | K9

APSC 101 Engineering Design and Practice F | K3.5

APSC 102 Experimentation F/W | K2

APSC 103 Engineering Client-based Design Project W | K3.5

APSC 111 Physics I F | 3.3

APSC 112 Physics II W | 3.3

APSC 114 Electricity and Magnetism W | 3.3

APSC 131 Chemistry and Materials F | 3.3

APSC 132 Chemistry of Natural and Engineered Systems W | 3.3

APSC 137 Introductory Chemistry for Technology Students S | 4.5

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

APSC 143 Introduction to Computer Programming for Engineers F | K3.3

APSC 151 Earth Systems Engineering F | 3.3

APSC 161 Engineering Graphics W | 3.5

APSC 162 Engineering Graphics W | 2.5

APSC 171 Calculus I F | K3.3

APSC 172 Calculus II W | 3.3

APSC 174 Introduction to Linear Algebra W, S | 3.3


APSC 191 Deleted - Professional Engineering Skills FW | 3.5
APSC 199 English Proficiency for Engineers FW, S | K0.2

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

APSC 202 Engineering Design and Practice II: Client-Based Design W | K4.3

APSC 210 Engineering Design and Practice S | K6.8

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

APSC 250 NOT OFFERED 2022-2023 Biology Through an Engineering Lens S/OL | K3.5

APSC 293 Engineering Communications I F/W/S | K1

APSC 301 Professional Internship | 3.5

APSC 302 Professional Internship | 3.5

APSC 303 Professional Internship | 3.5

APSC 304 Professional Internship | 3.5

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 NOT OFFERED 2022-2023 Technology, Engineering & Management (TEAM) FW* | K7

APSC 401 Interdisciplinary Projects W | K4.5

APSC 480 NOT OFFERED 2022-23 - Multi-disciplinary Industry Engineering Design Project FW | K9

BCHM 315 Proteins and Enzymes F | 3

BIOL 205 Mendelian and Molecular Genetics F | 3

BIOL 335 Limnology and Aquatic Ecology F | 3

CHEE 209 Analysis of Process Data F | 3.5

CHEE 210 Thermodynamics of Energy Conversion Systems 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
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CHEE 410 Engineering Innovation and Entrepreneurship W | K3.5
CHEE 412 Transport Phenomena W | 3.5
CHEE 414 Foundations of the Oil and Gas Industry W | K3.5
CHEE 415 Engineering Chemistry Laboratory W | 4
CHEE 418 Strategies for Process Investigations F | 3.5
CHEE 420 Laboratory Projects III W | K4
CHEE 421 Research Project FW | K7
CHEE 434 NOT OFFERED 2022-2023 Process Control II W | 3.5
CHEE 436 Deleted-System Identification F | 3.5
CHEE 440 Pharmaceutical Technology W | 3.5
CHEE 450 DELETED - Engineering Biology W | 3.5
CHEE 452 Transport Phenomena in Physiological Systems F | 3.5
CHEE 460 Applied Surface and Colloid Science F | 3.5
CHEE 463 Electrochemical Energy Systems W | 3.5
CHEE 470 DELETED - Design of Manufacturing Processes F | K 7
CHEE 471 Chemical Process Design FW | K7
CHEE 481 DELETED - Air Quality Management W | 3.5
CHEE 484 NOT OFFERED 2022-2023 Bioremediation W | 3.5
CHEE 490 NOT OFFERED 2022-2023 Polymer Formulations and Processing Technology W | 3.5
MICR 360 Immunology F | 3
CIVL 200 Professional Skills I F | K2.5
CIVL 201 Professional Skills F/W | 2.5
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CIVL 451 Lake, Reservoir and Coastal Engineering F | 3.75
CIVL 455 River Engineering F | 4
CIVL 460 Civil Engineering Design and Practice IV FW | K6
CIVL 470 Deleted - Municipal Water Engineering |
CIVL 471 Subsurface Contamination F | 4
CIVL 472 Water Treatment W | 3.75
CIVL 473 Water Resources System W | 3.75
CIVL 490 Selected Topics in Civil Engineering F | 3.75
CIVL 491 Selected Topics in Civil Engineering W | 3.75
CIVL 500 Civil Engineering Thesis FW | K4
CMPE 204 Logic for Computing Science F/W | K3
CMPE 212 Introduction to Computing Science II F/W | 4
CMPE 223 Software Specifications W | 3
CMPE 251 Data Analytics F | K3
CMPE 271 DELETED - Scientific Computing W | 3
CMPE 320 Fundamentals of Software Development F | 4
CMPE 322 Software Architecture W | K4
CMPE 324 Operating Systems W | 3
CMPE 325 Human-Computer Interaction W | 3
CMPE 326 Game Architecture DELETED F | 4
CMPE 327 Software Quality Assurance F | 3
CMPE 330 Computer-Integrated Surgery F | 3
CMPE 332 Database Management Systems W | 3
CMPE 333 DELETED Data Analytics F | 3
CMPE 351 Advanced Data Analytics W | 3
CMPE 365 Algorithms I F | 4
CMPE 422 Formal Methods in Software Engineering F | 3
CMPE 425 NOT OFFERED 2022-2023 Advanced User Interface Design W | 3
CMPE 432 NOT OFFERED 2022-2023 Advanced Database Systems F | 3
CMPE 434 NOT OFFERED 2022-2023 Distributed Systems F | 3
CMPE 452 Neural Networks and Genetic Algorithms F | 3
CMPE 454 Computer Graphics W | 3
CMPE 458 Programming Language Processors W | 4
CMPE 471 Computational Biology F | 3
CMPE 472 Medical Informatics W | 3
CMPE 480 Deleted - Computational Biology Laboratory W | K 1

ELEC 210 DELETED Introductory Electric Circuits and Machines W | 4.25
ELEC 221 Electric Circuits F | 4.25
ELEC 224 Continuous-Time Signals and Systems W | 3.75
ELEC 252 Electronics I W | 4.25
ELEC 270 Discrete Mathematics with Computer Engineering Applications W | 3.5
ELEC 271 Digital Systems F | 4
ELEC 273 DELETED - Numerical Methods and Optimization W | 3.5
ELEC 274 Computer Architecture W | 4
ELEC 278 Fundamentals of Information Structures F | 4
ELEC 279 Introduction to Object Oriented Programming W | 4
ELEC 280 Fundamentals of Electromagnetics W | 3.75
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ELEC 448 Introduction to Robotics: Mechanics and Control F | 3.5
ELEC 454 NOT OFFERED 2022-2023 Analog Electronics W | 3.25
ELEC 457 Integrated Circuits and System Applications F | 3.25
ELEC 461 NOT OFFERED 2022-2023 Digital Communications F | 3.5
ELEC 464 Wireless Communications W | 3
ELEC 470 Computer System Architecture W | 3.5
ELEC 472 Artificial Intelligence W | 3.5
ELEC 473 Cryptography and Network Security F | 3
ELEC 474 NOT OFFERED 2022-2023 Machine Vision F | 3.5
ELEC 476 DELETED - Modelling and Systems Simulation W | 3.5
ELEC 478 DELETED - Computer Networks II W | 3
ELEC 481 Applications of Photonics F | 3
ELEC 483 Microwave and RF Circuits and Systems W | 4.25
ELEC 486 NOT OFFERED 2022-2023 Fiber Optic Communications F | 3.75
ELEC 490 Electrical Engineering Project FW | K7
ELEC 491 DELETED - Advanced ECE Thesis I S | 6
ELEC 492 DELETED - Advanced ECE Thesis II FW | 6
ELEC 497 Research Project FW/S | K3.5
ELEC 498 Computer Engineering Project FW | K7
SOFT 423 Software Requirements W | 3
SOFT 437 Performance Analysis F | 3
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<td>ENCH 417</td>
<td>Research Project FW</td>
<td>FW</td>
<td>9</td>
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<tr>
<td>ENCH 421</td>
<td>Advanced Methods in Physical Chemistry</td>
<td>W</td>
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<tr>
<td>ENCH 422</td>
<td>Not Offered 2022-2023 Synthetic Organic Chemistry</td>
<td>W</td>
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<tr>
<td>ENCH 423</td>
<td>Topics in Inorganic and Organometallic Chemistry</td>
<td>W</td>
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<tr>
<td>ENCH 424</td>
<td>Polymer Chemistry</td>
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<td>3</td>
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ENCH 425 NOT OFFERED 2022-2023 - 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 DELETED - Management of Experimental Data W | 1.25
ENPH 253 Engineering Physics Laboratory W | K3.5
ENPH 274 Deleted - Thermodynamics W | 3.5
ENPH 312 DELETED - Mathematical Methods in Physics FW | 7
ENPH 316 Mathematical Methods in Physics I F | 3.5
ENPH 317 Mathematical Methods in Physics II W | 3.5
ENPH 321 Advanced Mechanics F | 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 Experiment Design 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 W | 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 479 High Performance Computing in Engineering Physics W | 3
ENPH 480 Solid State Physics F | 3.5
ENPH 481 Solid State Device Physics F | 3.5
ENPH 483 NOT OFFERED 2022-2023 - Nanoscience and Nanotechnology W | 3.5
ENPH 487 Deleted - Surface Engineering and Analysis F | 3
ENPH 490 Nuclear Physics F | 3.5
ENPH 491 NOT OFFERED 2022-2023 - Physics of Nuclear Reactors F | 3.5
ENPH 492 Plasma Physics F, W | 3.5
ENPH 493 NOT OFFERED 2022-2023 Plasma Physics W | 3.5
ENPH 495 Introduction to Medical Physics W | 3
ENPH 555 Accelerated Engineering Physics Thesis FW | 4
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 | 5
GEOE 232 Mineralogy F | 4.5
GEOE 235 Genesis and Characterization of Solid Earth Materials W | 4
GEOE 238 Surficial Processes, Sedimentation and Stratigraphy W | 4
GEOE 249 Geophysical Characterization of the Earth W | 3.5
GEOE 262 Geological Aspects of Mineral Deposits W | 3.75
GEOE 281 Introduction to Geological Engineering F | 4
GEOE 300 Geological Engineering Field School F | K4
GEOE 301 Field Studies in Geology F | 1.5
GEOE 310 Deleted - Geological Engineering Field School |
GEOE 313 Engineering Geology and Geomechanics W | 4
GEOE 319 Applied Geophysics W | 4.5
GEOE 321 Analysis of Rock Structures F | 4
GEOE 323 Deleted - Quaternary Glacial Geology |
GEOE 333 Terrain Evaluation W | 4
GEOE 337 Paleontology F | 3.75
GEOE 340 Problems in Geological Engineering F/W | 3
GEOE 341 Special Topics in Applied Geology F/W/S | 3
GEOE 343 Applied Hydrogeology F | 3.5
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 | 4.5
GEOE 365 Geochemical Characterization of the Earth F | 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 | K4
GEOE 413 Rock Engineering Design F | 3.5
GEOE 414 Foundations of the Oil and Gas Industry W | 3.5
GEOE 418 Petroleum Geology F | 4.5
GEOE 419 NOT OFFERED 2022-2023 Engineering Geophysics Field School F | K4
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 F | K3
GEOE 441 Special Topics in Applied Geology F, W, S | K3
GEOE 445 Deleted - Site Investigation and Case Histories F | 3.5
GEOE 446 Engineering Design Project I F | K4
GEOE 447 Engineering Design Project II W | K5.5
GEOE 452 Instrumental Techniques Applied to the Study of Solids W | 3
GEOE 462 Advanced Petrogenesis and Metallogenesis W | 4.5
GEOE 463 Spatial Information Management in the Geosciences F | 3.5
GEOE 464 Visualization in Geosciences W | 1.5
GEOE 465 Deleted - Exploration Geochemistry W | 3.5
GEOE 466 Isotopes and the Environment W | 4
GEOE 475 Exploration and Environmental Geochemistry F | 4.3
GEOE 478 Terrigeneous Clastic Sedimentology F | 3.5
GEOE 481 Structural Analysis Applied to Resource Deposits W | 3.5
GEOE 485 Deleted - Environmental Aqueous Geochemistry W | 3
GEOE 488 Geology of North America F | 3
GEOL 382 Deleted - Resource Engineering F |
GISC 201 DELETED - Geographic Information Science W | 3
GISC 202 DELETED - Data Collection, Management and Analysis W | 4
GISC 301 DELETED - Spatial Analysis F | 3
GISC 302 DELETED - Environmental Modelling W | 3
GISC 303 DELETED - Application Design and Customization in GIS F | 3
GPHY 304 Arctic and Periglacial Environments W | 3
MBIO 218 NOT OFFERED 2022-2023 - Gene Structure and Function (Molecular Biology) W | 3.25
MDEP 221 Deleted - Engineering and Social Justice: Critical Theories of Technological Practices W | 3
MDEP 437 DELETED-Fuel Cell Technology F |
MECH 202 Mathematical and Computational Tools for Mechanical Engineers I F | K3.5
MECH 203 Mathematical and Computational Tools for Mechanical Engineers II W | K3.5
MECH 210 Electronic Circuits and Motors for Mechatronics W | K4.5
MECH 211 Manufacturing Methods F | 3.5
MECH 212 Machine Tool Laboratory F/W | 1.0
MECH 213 NOT OFFERED 2022-2023 Manufacturing Methods F | 4.5
MECH 215 DELETED-Instrumentation and Measurement F | 3.5
MECH 216 DELETED-Instrumentation and Measurement Labs F | K2
MECH 217 Measurement in Mechatronics F | 4.25
MECH 221 Solid Mechanics I F | 3.5
MECH 228 Kinematics and Dynamics F/W | K3.5
MECH 230 Applied Thermodynamics I F | 3.5
MECH 241 Fluid Mechanics I W | 3.5
MECH 270 Materials Science and Engineering F | 3.5
MECH 271 Deleted - Materials Science and Engineering |
MECH 273 Materials Science and Engineering Lab W | 1.0
MECH 302 Mathematical and Computational Tools for Mechanical Engineers III F | K3.5
MECH 310 Digital Systems for Mechatronics F | K4.5
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 NOT OFFERED 2022-2023 - 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 W | 3.5
MECH 394 Frontiers in Biomechanical Engineering 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 NOT OFFERED 2022-2023 - Vibrations W | 3.5

MECH 423 Introduction to Microsystems W | 3.5

MECH 424 NOT OFFERED 2022-2023 - Sustainable Product Design F | 3.5

MECH 430 NOT OFFERED 2022-2023 - Thermal Systems Design W | 4

MECH 435 Internal Combustion Engines W | 3.5

MECH 437 NOT OFFERED 2022-2023 - Fuel Cell Technology F | 3.5

MECH 439 NOT OFFERED 2022-2023 Turbomachinery W | 3.5

MECH 441 NOT OFFERED 2022-2023 - Fluid Mechanics III W | 3.5

MECH 444 Computational Fluid Dynamics F | 3.5

MECH 448 Compressible Fluid Flow W | 3.5

MECH 452 NOT OFFERED 2022-2023 - Mechatronics Engineering W | 5

MECH 455 Computer Integrated Manufacturing F | 3.5

MECH 456 Introduction to Robotics F | 3.5

MECH 457 Additive Manufacturing W | 4

MECH 458 DELETED - Machine Condition Monitoring and Fault Diagnostics F | 3.5

MECH 460 Team Project - Conceive and Design F | K4

MECH 461 Research Project W | K4

MECH 462 Team Project - Implement and Operate W | K3.5

MECH 463 Engineering Project for International Students F/W | K 2

MECH 464 Communications and Project Management F | 1.5

MECH 465 Computer-Aided Design F | 3.5

MECH 470 Deformation Processing W | 3.5

MECH 474 Deleted - Functional Ceramics |

MECH 475 Deleted - Structural Ceramics |
MECH 476 Engineering of Polymers and Composite Materials W | 3.5
MECH 478 Biomaterials F | 3.5
MECH 479 Nano-Structured Materials F | 3.5
MECH 480 Airplane Aerodynamics and Performance W | 3.5
MECH 481 NOT OFFERED 2022-2023 Wind Energy F | 3.5
MECH 482 NOT OFFERED 2022-2023 - Noise Control W | 3.5
MECH 483 Nuclear Materials F | 3.5
MECH 484 DELETED - Introduction to Ceramics F | 3.5
MECH 492 Biological Fluid Dynamics F | 3.5
MECH 494 Kinematics of Human Motion W | 3.5
MECH 495 Ergonomics and Design F | 3.5
MECH 496 Musculoskeletal Biomechanics F | 3.5
MINE 201 Introduction to Mining and Mineral Processing F | 4
MINE 202 DELETED - Computer Applications and Instrumentation in Mining F | 1.5
MINE 244 Underground Mining (changed to MINE 344) 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 272 Applied Data Science W | 4.5
MINE 307 NOT OFFERED 2022-2023 Front Line Supervision W | 1.5
MINE 321 Drilling and Blasting F | 4.5
MINE 324 DELETED - Hydraulics for Mining Applications W | 3.5
MINE 325 Applied Rock Mechanics F | 4.5
MINE 326 Operations Research W | 4.5
MINE 330 Mineral Industry Economics F | 3.5
MINE 331 Methods of Mineral Separation F | 4.5
MINE 335 Mineral Processing F | 3
MINE 339 Mine Ventilation W | 4.5
MINE 341 Open Pit Mining W | 4.5
MINE 344 Underground Mining W | 4
MINE 422 Mining and Sustainability F | 4
MINE 431 Life-Cycle Assessment for Green Technologies F | 3.5
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 | 4
MINE 455 Design, Analysis and Operation of Mineral Processes F | 4.5
MINE 458 Process Investigations W | 4
MINE 459 Risk and Reliability Analysis for Industrial Asset Management, Health & Safety F | 4
MINE 460 Special Topics in Mining Engineering F/W | 4.5
MINE 462 DELETED - Occupational Health and Safety in Mining Practice W | 3.5
MINE 467 Geostatistics and Orebody Modelling F | 4.5
MINE 469 DELETED - Stability Analysis in Mine Design F | 4
MINE 471 Mine-Mechanical Design Project W | 5.5
MINE 472 Not Offered 2021-2022 Mining Systems, Automation, and Robotics O/L | K3.5
MNTC P01 Engineering Mathematics O/L | 3
MNTC P02 Mining Geology O/L | 3
MNTC P03 Foundational Mathematics O/L | 3
MNTC P04 Calculus O/L | 3
MNTC P05 Foundational Physics O/L | 3
MNTC P06 Foundational Chemistry O/L | 3
MNTC P07 Surveying Principles O/L | 3
MNTC 301 Technical Writing and Communication O/L | 3
MNTC 302 Engineering Physics O/L | 3
MNTC 303 Engineering Chemistry O/L | 3
MNTC 304 Applied Metrology and Data Analysis O/L | 3
MNTC 305 Introduction to Mining O/L | 4
MNTC 306 Mineral Processing Unit Operations O/L | 3
MNTC 307 Geomechanics and Ground Control O/L | 4
MNTC 310 Mining and Society O/L | 3
MNTC 311 Ore Body Modelling and Resource Estimation O/L | 4.5
MNTC 313 Introduction to Programming O/L | 3
MNTC 314 Drilling and Blasting O/L | 4
MNTC 316 Ventilation and Hydraulics O/L | 4
MNTC 399 Field School I (on site) S | 5
MNTC 408 Mine Health and Safety O/L | 3
MNTC 409 Mineral Economics O/L | 3.5
MNTC 413 Surface Mine Planning O/L | 4
MNTC 414 Underground Mine Planning O/L | 4
MNTC 415 Metal Extraction Processes O/L | 4
MNTC 418 Sustainability and the Environment O/L | 3
MNTC 419 Mine Supervision and Project Management O/L | 3
MNTC 420 Physical Asset Management O/L | 3
MNTC 423 Geomatics O/L | 3
MNTC 498 Capstone Project O/L | 3

MNTC 499 Field School II (on site) S | 5

BIOM 300 Modeling Techniques in Biology W | 3

MTHE 212 Linear Algebra W | 3.5

MTHE 217 Algebraic Structures with Applications F | 3.5

MTHE 224 Applied Mathematics for Civil Engineers F | 4.2

MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5

MTHE 227 Vector Analysis F | 3

MTHE 228 Complex Analysis W | 3.5

MTHE 232 Deleted - Differential Equations |

MTHE 235 NOT OFFERED 2022-2023 - Differential Equations for Electrical and Computer Engineers F | 3.5

MTHE 237 Differential Equations for Engineering Science F | 3.5

MTHE 272 NOT OFFERED 2022-2023 - Application of Numerical Methods W | 3.5

MTHE 280 Advanced Calculus F | 3.5

MTHE 281 Introduction to Real Analysis W | 3.5

MTHE 312 Deleted - Linear Algebra |

MTHE 326 Functions of a Complex Variable F | 3.5

MTHE 328 Real Analysis W | 3

MTHE 332 NOT OFFERED 2022-2023 - Introduction to Control W | 4

MTHE 333 Deleted - Control-Robotics Lab I |

MTHE 334 NOT OFFERED 2022-2023 - Mathematical Methods for Engineering and Physics F | 3.5

MTHE 335 Mathematics of Engineering Systems W | 3.5

MTHE 337 Introduction to Operations Research Models W | 3

MTHE 338 Fourier Methods for Boundary Value Problems W | 3.5

MTHE 339 NOT OFFERED 2022-2023 Evolutionary Game Theory W | 3
MTHE 351 Probability I F | 3.5

MTHE 353 Probability II W | 3

MTHE 367 NOT OFFERED 2022-2023 - Engineering Data Analysis W | 3.5

MTHE 393 Engineering Design and Practice for Mathematics and Engineering W | K4

MTHE 406 Introduction to Coding Theory F | 3

MTHE 418 NOT OFFERED 2022-2023 - Number Theory and Cryptography W | 3

MTHE 430 Control Theory F | 4

MTHE 433 Continuum Mechanics with Applications F | 3

MTHE 434 NOT OFFERED 2022-2023 - Optimization Theory with Applications to Machine Learning W | 3.5

MTHE 437 Topics in Applied Mathematics W | 3.5

MTHE 439 NOT OFFERED 2022-2023 - Lagrangian Mechanics, Dynamics, and Control W | 3.5

MTHE 454 NOT OFFERED 2022-2023 - Statistical Spectrum Estimation W | 3

MTHE 455 Stochastic Processes and Applications F | 3.5

MTHE 457 Statistical Learning W | 3

MTHE 472 Optimization and Control of Stochastic Systems W | 3.5

MTHE 474 Information Theory F | 3.5

MTHE 477 Data Compression and Source Coding: Theory and Algorithms W | 3

MTHE 478 NOT OFFERED 2022-2023 - Topics in Communication Theory F/W | 3

MTHE 484 NOT OFFERED 2022-2023 - 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

MREN 103 Mechatronics Design I W | K4

MREN 104 Mechatronics Design Project F | K1.7

MREN 178 Data Structures and Algorithms W | 4

MREN 203 Mechatronics Design II W | 4

MREN 223 Signals and Systems W | 5

MREN 230 Thermodynamics and Heat Transfer W | 3.75

MREN 241 Fluid Mechanics and Fluid Power F | 3.75

MREN 303 Mechatronics Design III W | 4

MREN 318 Sensors and Electric Actuators F | 5.5

MREN 320 Automation: Machine Design and Control W | 3.5

MREN 348 Introduction to Robotics W | 3.5

MREN 403 Mechatronics Design IV FW | 8

MREN 410 Intelligent Machines and Autonomous Systems F | 3.5

ANAT 100 Anatomy of the Human Body F,W,S | 3.0

BCHM 310 Deleted-General Biochemistry FW | 9

BCHM 410 Deleted-Protein Structure and Function F | 3

BIOL 102 Deleted-Introductory Biology of Cells F | 3

BIOL 103 Deleted-Introductory to Biology of Organisms W | 3

Admission and Fees

Admissions

Information on Admissions

Students who are considering applying to Queen's are directed to Queen's Admission Services at: http://www.queensu.ca/admission. The Admissions website provides information regarding the admission requirements for all undergraduate programs, facilities and services, residences, scholarships and financial assistance.

Campus Visits
Applicants and potential applicants are encouraged to visit the Queen's campus, as well as the Faculty of Engineering and Applied Science. Formal arrangements can be made by contacting engineering.reception@queensu.ca.

Criteria

Admission is offered to the best qualified students applying. Academic success is the primary criterion for admission to Engineering and Applied Science. Students whose academic performance exceeds a required minimum will receive an offer of admission. In all other cases, students will be evaluated on a combination of their academic and non-academic achievements. Submission of a completed Personal Statement of Experience (PSE) form is required for all first year applicants.

Fees

The Board of Trustees reserves the right to make changes in the scale of fees if, in its opinion, circumstances so warrant.

Tuition Fees

Tuition fees are reviewed each year and are dependent on government funding and regulation. Specific information on tuition levels is available on the Web at http://queensu.ca/registrar/financials/tuition-fees. Students are encouraged to become familiar with this information.

Ancillary Fees

Students may be required to pay ancillary fees for course related learning materials, safety equipment and field trips. The maximum estimated compulsory fees for specific academic plans are shown below. Those plans not listed do not have ancillary fees. In most cases the actual cost to individual students will be less than the amount indicated.

<table>
<thead>
<tr>
<th>First Year</th>
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<tr>
<td>Engineering Physics</td>
<td>15</td>
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<tr>
<td>Geological Engineering¹</td>
<td>595</td>
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<tr>
<td>Mechanical Engineering²</td>
<td>100</td>
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<tr>
<td>Mining Engineering³</td>
<td>250</td>
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</table>

¹See the Geological Engineering website for a breakdown and explanation of costs.

²Fee for MECH 370 optional field trip.

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

Non-compulsory Fees
<table>
<thead>
<tr>
<th>Service</th>
<th>Fee</th>
<th>Payment Information</th>
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</thead>
<tbody>
<tr>
<td>Request for Course Substitution</td>
<td>60.00</td>
<td>Payable through Student Services. See <a href="https://engineering.queensu.ca/Current-Students/forms-online.html">https://engineering.queensu.ca/Current-Students/forms-online.html</a> for official form and payment information.</td>
</tr>
<tr>
<td>Course Description Request</td>
<td>60.00/hr</td>
<td>Payable through Student Services. Contact <a href="mailto:engineering.reception@queensu.ca">engineering.reception@queensu.ca</a> to make request and discuss payment.</td>
</tr>
<tr>
<td>Document Fee</td>
<td>30.00</td>
<td>Payable through Student Services. Contact <a href="mailto:engineering.reception@queensu.ca">engineering.reception@queensu.ca</a> to make request and discuss payment.</td>
</tr>
<tr>
<td>Exchange Program Fee</td>
<td>125.00</td>
<td>Payable through Student Services. Contact the International Student Advisor at <a href="mailto:engineering.intladvisor@queensu.ca">engineering.intladvisor@queensu.ca</a> for more information.</td>
</tr>
<tr>
<td>Exam Rereads</td>
<td>50.00</td>
<td>Payable through Student Services. See <a href="https://engineering.queensu.ca/Current-Students/forms-online.html">https://engineering.queensu.ca/Current-Students/forms-online.html</a> for official form and payment information.</td>
</tr>
<tr>
<td>Internship Program - application fee</td>
<td>35.00</td>
<td>Please contact Micheline Johnston at <a href="mailto:micheline.johnston@queensu.ca">micheline.johnston@queensu.ca</a> for application and payment information.</td>
</tr>
<tr>
<td>Late Application to Graduate</td>
<td>60.00</td>
<td>Payable through Student Services. See <a href="https://engineering.queensu.ca/Current-Students/forms-online.html">https://engineering.queensu.ca/Current-Students/forms-online.html</a> for official form and payment information.</td>
</tr>
<tr>
<td>Registered Education Savings Plan - form completion</td>
<td>30.00</td>
<td>Payable through Student Services. Contact <a href="mailto:engineering.reception@queensu.ca">engineering.reception@queensu.ca</a> to make request and discuss payment.</td>
</tr>
<tr>
<td>Supplemental Examinations</td>
<td>300.00</td>
<td>Payable through SOLUS</td>
</tr>
</tbody>
</table>

**Extended Program (Section 900/J-Section) & Rewrite Exams:**
Extended Program - Section 900 per course tuition fee\(^1\) | 539.63 | Payable through SOLUS
---|---|---
Rewrite Exam - per exam fee (Spring term) | 300.00 +SAL | Payable through SOLUS

\(^1\)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.

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/](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**

We do not accept cash payments at any time. Credit card payments may be made in the Faculty of Engineering and Applied Science Online Store [https://store.engineering.queensu.ca/](https://store.engineering.queensu.ca/).

No form that requires a Student Services payable fee will be processed without payment.

Cheques are to be made out to "Queen's University".

PLEASE 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/](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**

All FEAS Policies conform with Senate policies. All Faculty Regulations are approved by Senate. Senate Policies of particular relevance to students in Engineering and Applied Science are outlined below. The relevant links are provided through the Calendar website under "Senate Policies".

Access and Privacy

Student Appeals, Rights and Discipline

Policy on Academic Integrity

Student Access to Final Examination Papers

Confidential Exams

Electronic Information Security Policy Framework

**Academic Integrity Policy Statement**

Queen's University is dedicated to creating a scholarly community free to explore a range of ideas, to build and advance knowledge, and to share the ideas and knowledge that emerge from a range of intellectual pursuits. Queen's students, faculty, administrators and staff therefore all have responsibilities for supporting and upholding the fundamental values of academic integrity. Academic integrity is constituted by the five core fundamental values of honesty, trust, fairness, respect and responsibility (see http://www.academicintegrity.org/ica/home.php) and by the quality of courage. These values and qualities are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University.

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.
Faculty Regulations

1. Registration

   a. A student must register in courses within the first two weeks of the commencement of term.
   
   b. 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 FEAS Faculty Board Committee.
   
   c. A student must withdraw from courses within the first two weeks of the commencement of term to avoid financial penalty.
   
   d. A student may withdraw voluntarily from a Fall Term course or a Winter term course prior to the deadline to drop without faculty permission. If so dropped, the course is removed from student record.
   
   e. Withdrawal from a course after the prescribed deadline to drop without faculty permission requires the approval of the Undergraduate Chair and the FEAS Faculty Board Committee, and will only be permitted in exceptional circumstances that would prevent the student from dropping the course within the prescribed deadline. Withdrawals such as these will be indicated on the student's transcript by the designation DR (see Regulation 3h).
   
   f. A student may apply for a change from one FEAS academic plan to another by July 31st for the Fall term and by December 1st for the Winter term. Late requests will be considered until August 15th for Fall term and December 15th for Winter term and will be subject to late application fees. Requests are submitted for the approval of the Associate Dean (Academic).
   
   g. Students must obtain approval from Student Services, FEAS, to add or drop first year courses.
   
   h. 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.
   
   i. 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 faculty permission only within the first three weeks of the Summer Term.

2. Programs of Study

   a. 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 Undergraduate Chair for the academic plan, or the year advisors in the department, should be consulted whenever requirements are not fully understood.
   
   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 first year course at the next examination period only if the student's term Grade Point Average (GPA) is 0.7 or higher in both Fall and Winter terms.
   
   c. An upper year student may request an exemption in a course by application to the FEAS Faculty Board Committee or delegate on the basis of knowledge acquired through practical experience or 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 exempted course material. In cases where the student's total units fall below the minimum CEAB requirement, a replacement course of 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 permission for substitution of a course in their program by a similar course, either at Queen's or elsewhere, by application to the FEAS Faculty Board Committee. This request must be submitted prior to completing 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.

e. A student seeking a degree in FEAS 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.

f. Free discipline choice of academic plan (discipline) is only guaranteed during the winter term selection period, and only for students who have passed all their first year courses. In exceptional circumstances (i.e., academic difficulty, please refer to Regulation 10) a student may not be permitted to choose a discipline, and may instead be required to repeat first year

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 Associate Dean. During this session, the student must pass all prerequisite courses or they may be required to withdraw.

h. Students who have not passed important prerequisite courses in the first-year program and/or have a cumulative GPA below 1.6 may be determined to have deficits in the requisite knowledge, which would prevent them from successfully progressing into their upper year programs. These students will be required to remain in the first-year program for the next academic session. During this session, the students will be required to follow a special program (please refer to Regulation 10bii).

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 thus equal to the number of weeks in a term, i.e. 1 unit = 12 AUs for a 12-week course. 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.

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Grade Points</th>
<th>Numeric Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>4.3</td>
<td>90-100%</td>
</tr>
<tr>
<td>A</td>
<td>4.0</td>
<td>85-89%</td>
</tr>
<tr>
<td>A-</td>
<td>3.7</td>
<td>80-84%</td>
</tr>
</tbody>
</table>
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 term GPA. When, during the period considered, a course or a course examination is repeated or replaced by a substitution approved by the FEAS Faculty Board Committee, only the most recently obtained mark will be used in calculating the GPA. Changes to the GPA after the assessment period in May will not impact student assessment decisions.

c. The "Academic Year" concludes at the end of winter term, and includes the previous three consecutive terms (summer, fall, winter). The Engineering term GPA is the Grade Point Average of all Queen's courses taken in an Engineering term in an academic year, while the student is registered in the FEAS. Decisions regarding yearly academic progress will be based on term GPA.

d. The Engineering Cumulative Grade Point Average (ECGPA) is the Grade Point Average of all courses taken in the Summer, 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.

e. For Classes Spring 2022 and earlier only: The Engineering Graduation Grade Point Average (EGGPA) is calculated after all academic plan 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.

f. 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 Fall and Winter term GPA and the ECGPA.
Non-evaluative grades: The following is a list of the possible non-evaluative grades and their uses.

Incomplete (IN):
Incomplete standing (IN) is a temporary designation normally reserved for cases where students, because of extenuating circumstances beyond their control, have successfully completed the majority of the graded work, but not all course work (which may include, but is not limited to, assignments, projects, quizzes, mid-terms, and final exams). All Incomplete designations require appropriate supporting documentation, and must be approved by the FEAS Faculty Board Committee. Approval of the instructor must be obtained, and a date will be 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. Please see Regulation 4b for further information.

Pass in a Pass/Fail Course (P)
Some courses do not apply letter grades. The outcome is Pass (P) or Fail (F) to reflect whether the student has successfully fulfilled all the requirements. A course that has been designated as Pass/Fail will not be included in the student's GPA but can be counted as credit towards an academic plan.

Dropped (DR)
The Dropped (DR) designation indicates a course that has been dropped after the deadline to drop without faculty permission. This designation can only be applied with approval from the FEAS Faculty Board Committee. For information, please see Regulation 1e.

Failure with Review (FR)
For information, please see Regulation 14 - Supplemental Examinations

Grade Deferred (GD)
The Grade Deferred (GD) designation is a temporary designation used in situations where a student's final grade in a course is being held.

Audit (AU)
The AU designation indicates that a course has been Audited. For information, please see Regulation 16b.

Credit Standing (CR)
Credit standing (CR) is a permanent designation normally reserved for exceptional cases where students, who have completed all of the work for a course, and achieved a passing grade in the course, but due to illness or other extenuating circumstances beyond their control, earned a substantially lower grade than might have been expected. A student seeking credit standing in a course must submit their request (supported by their course instructor) and appropriate supporting documentation to the FEAS Faculty Board Committee for consideration. If the request is granted, the designation CR will appear on the student's transcript in place of a letter grade. CR grades will not be included in the student's GPA, and cannot be reversed to a letter grade. Students may be granted credit standing for a maximum of 18.0 units during their entire program.

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 course work, should be made available to students by the instructor via the course syllabus 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 Undergraduate Chair, and upon approval by the FEAS Faculty Board Committee (see regulation 3h). The submission of a mark of IN must be accompanied by appropriate supporting documentation, and by a proposed date of completion, 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 term GPA and Cumulative GPA 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 11.
   b. A student who claims illness, compassionate grounds, or other extenuating circumstances, as a reason for missing any required component of the course other than the final exam is responsible to notify the instructors concerned, and make alternative arrangements. If there is a significant effect on attendance or academic performance such that the student may wish to request an incomplete (IN) grade, a course drop or a late course drop the student is responsible for providing appropriate supporting documentation to the FEAS Faculty Board Committee. Students are encouraged to seek academic advise from a program or faculty advisor to obtain guidance on the appropriate action, and the relevant documentation requirements. Refer to Academic Regulation 4b for procedures and documentation required to request an incomplete grade.

6. **Examinations**
   a. Students are referred to the Exam Regulations located on the website of the University Registrar.
   b. An in-person, online, or remote exam (proctored or unproctored) final exam may be declared invalid under the circumstances outlined below. Students who had their final exam declared invalid may retake the examination, typically during the September supplemental examination period.

   i) Insurmountable technical difficulties outside of the student's control (including but not limited to camera and/or computer malfunction, internet loss, etc.)

      i) The student would normally be eligible to apply for the temporary grade designation of incomplete (IN) in the course until they are able to retake the examination.

      ii) Failure to meet or follow the rules and guidelines as outlined in the examination instructions both prior to and during the in-person, online, or remote exam (proctored or unproctored) or take-home examination, if there is no sufficient evidence of a Departure from Academic Integrity (DFAI).

         i) The temporary designation of grade deferred (GD) will be applied to the impacted course until the student completes the examination.

         ii) A declaration of an invalid exam does not preclude a DFAI investigation, if sufficient evidence becomes available. For further information, please see the policies on (DFAI).

         iii) Students who have recurrent invalid examinations due to circumstances outlined under b) may be subject to further disciplinary action under the Faculty Departure from Academic Integrity policy. For further information, please see the policies on (DFAI).

   In cases where another type of assessment is declared invalid under the circumstances outlined in i)- iii) above, mitigating measures will be decided upon by the instructor discretion in consultation with the Associate Dean (Academic).

7. **Requirements for Graduation**
   To qualify for the degree of Bachelor of Applied Science (B.A.Sc.) in engineering, in the FEAS, a student must, at the end of not more than six active (but not necessarily consecutive) 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 academic plan in which they registered;
   c. while registered in their engineering program, have passed courses whose units total is not less than the minimum required by the program in which they are registered and each course may be counted only once;
d. have achieved an 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 (for Classes 2022 and earlier). Note: students who have not passed the English Proficiency Test as of Fall 2019 will be required to take APSC 199 (English Proficiency for Engineers).

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 Accessibility Services, or through academic advising. If a student is allowed to continue, on successful appeal of this regulation, their program of study will be reviewed by the Department and the Faculty. 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. **Scholarships**

   a. 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 they are 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 FEAS Faculty Board Committee for scholarship purposes must be added to the student's program. Substitutions granted under Regulation 2e are also acceptable.

   b. To be eligible for the Dean's Scholars list, a student must achieve a combined term (Fall and Winter) GPA of 3.5 or higher while taking 30 units or higher over the Fall and Winter term. If granted, a Dean Scholars ruling will be added to the student's academic transcript.

9. **Graduation with Honours Standing**

   A student will be granted the status of graduation "with Second Class Honours" if, upon graduation, they have attained either an ECGPA of 2.2 or higher. A student will be granted the status of graduation "with First Class Honours" if, upon graduation, they have attained an ECGPA of 3.5 or more. *(For Classes Spring 2022 and earlier only: The Engineering Graduation Grade Point Average (EGGPA) is calculated after all academic plan 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.)*

10. **Academic Probation and Requirement to Withdraw**

    **Academic Probation**

    a. Students shall be placed on Academic Probation, at the time of their academic standing assessment, if they:

    i. Have an ECGPA between 0.7 and 1.59.
    ii. Have obtained a term GPA below 1.6 in both the Fall and Winter term.
    iii. Have obtained a term GPA below 0.7 after the Fall or Winter term. At the discretion of the Associate Dean (Academic), these students may be placed on academic probation for the following term, and they will be reassessed at the end of that term.
iv. Have returned to studies after having previously been Required to Withdraw.

v. Have returned to studies after a voluntary deferral (see reg. 11). These students may also be placed on probation at the discretion of the Associate Dean (Academic) and the student's department.

In all above cases 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 placed on academic probation under Regulation 10a must repeat courses specified by the Associate Dean, in consultation with the Undergraduate Chair for the academic plan in which the student is registered.
   ii. The Associate Dean, in consultation with the Undergraduate Chair for the academic plan 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 and will be considered in 'good academic standing'.

d. 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.

Requirement to Withdraw, with opportunity to be considered for readmission after one year:

e. A student will be required to withdraw for a period of at least one year, and may be considered for readmission only after one year if they:
   i. Have an ECGPA less than 0.7 and/or
   ii. Have a term GPA less than 0.7 in both the Fall and Winter term, or for one term (for students who have completed only one Fall or Winter term) and/or
   iii. Are on Academic Probation under Regulation 10a and do not fulfill all of their conditions of Academic Probation.

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:

f. A student will be required to withdraw for a period of three years if they have failed a previous year and they:
   i. Have an ECGPA less than 0.7 and/or
   ii. Have a term GPA less than 0.7 in both the Fall and Winter term, or for one term (for students who have completed only one Fall or Winter term) and/or
   iii. Are on Academic Probation under Regulation 10a and do not fulfill all of their conditions of Academic Probation.

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 experiencing academic difficulty (refer to Regulation 10) may request a deferral of their studies no later than 31 January. The student must apply for a resumption of studies to the FEAS.
Students returning to studies after a deferral will be placed on academic probation for their returning year.

b. The Faculty Board may, at any time, require a student whose conduct, attendance, or work is deemed unsatisfactory, to withdraw or may recommend to Senate a student's dismissal. The student must reapply in order to be considered for readmission to the FEAS.

c. A student who defers their program for any reason, or is not registered in the FEAS for twelve consecutive months, must reapply in order to be considered for readmission/resumption of studies.

12. **Readmission**

a. A student applying for readmission after a failed year must present evidence that they are likely to succeed in completing the degree in the program for which readmission is sought. The student shall not be readmitted unless the Associate Dean (Academic) 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 to the program may, at the discretion of the Associate Dean (Academic) and the student's Undergraduate Chair, be placed on Academic Probation and subsequently 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, students placed on probation after a failed year or following readmission must fulfill all of their conditions of Academic Probation or be required to withdraw.

13. **Review and Rereading of Examination Papers**

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 exam re-read request to the FEAS. The exam re-read request must be submitted in writing to the FEAS within four weeks of the release of results. The application is to be accompanied by the rereading fee.

(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, upon formal request to the FEAS, 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 has obtained a term GPA of 0.7 or higher in the previous Fall and Winter terms. Supplemental examinations will be held at Queen's University in September, typically during orientation week. The privilege of writing these supplemental examinations will be confined to this September week following the session in which the failure occurred, and limited to a maximum of three examinations in the student's academic plan, with no more than two in any calendar year. Supplemental examinations cannot be rescheduled, and there are no provisions for make-ups of the supplemental examinations.

b. A student requesting permission to write a supplemental examination must apply in writing to the FEAS by the specified deadline 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 the specified deadline 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 they are registered and who has not canceled their registration by the specified date will be assigned 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. Supplemental marks will not impact or change any previous student assessment decisions.
15. Written English Proficiency (Classes 2022 and earlier only)
   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. Special Students
   a. Students may be allowed to take courses in the FEAS without being registered in an academic plan. Such students are defined as "Special Students" and must apply to the Faculty before taking any 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.
   b. Students interested in auditing an Undergraduate FEAS course must apply to the Faculty, and approval is given on a case by case basis and only when there is space in the course (refer to reg. 3h).

*NOTE: The following regulations do not apply to Bachelor of Mining Engineering Technology (BTech)
Regulation 1b, Regulation 1f, Regulation 1g, Regulation 2g, Regulation 3a, Regulation 3d, Regulation 3e, Regulation 7, Regulation 10, Regulation 14

17. Regulations Specific to the Bachelor of Mining Engineering Technology program

Students enrolled in the Bachelor of Mining Engineering Technology ("B Tech") program have specific Bridge Course requirements, as well as specific regulations relating to Requirements for Graduation (replacing Regulation 7), and Academic Probation and Requirements to Withdraw (replacing Regulation 10). The following Regulations apply to BTech students:
   a. Bridge Course Requirements - BTech (MINE)

      Upon admission to the BTech program, each student will be enrolled in specific, required, Bridge courses based on their previous academic history. The required Bridge courses for each student may be different, and will be determined by the Associate Dean (Academic) in consultation with the Program Chair for the BTech (MINE) program. In order to be admitted into the Year 3 of the BTech (MINE) program, a student must pass each required Bridge course with a minimum grade of C-.

   b. Requirements for Graduation - BTech (MINE)

      To qualify for the degree of Bachelor of Mining Engineering Technology in the FEAS, a student must, at the end of not more than ten calendar years from date of first registration in the Faculty:

      i. Have passed all courses required by the BTech (MINE) program
      ii. Have achieved an Engineering Cumulative Grade Point Average (ECGPA) of 1.3 or higher
      iii. Have successfully completed field and technical excursions required by the BTech Program.
      iv. Have passed the English Proficiency Test. Note: students who have not passed the English Proficiency Test as of Fall 2019 will be required to take APSC 199 (English Proficiency for Engineers).

A student who has not completed the degree program within ten years of first registering will normally be required to withdraw. An extension will normally be granted to students who have received accommodation that requires a lighter course load through the Queen's Accessibility Services, or through academic advising. If a student is allowed to continue, on successful appeal of this regulation, his/her program of study will be
reviewed by the BTech (MINE) Undergraduate Chair and the Faculty. 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 are no longer part of the academic plan may not count toward the degree.
- Additional courses which have been added to the degree program may be required for graduation.
- Courses which have changed significantly in content may have to be retaken.

### c. Academic Probation and Requirement to Withdraw - BTech (MINE)

#### Academic Probation

i. A student shall be placed on Academic Probation, at the time of their academic standing assessment, if they:
   1. have an ECGPA of less than 1.3. NOTE: the ECGPA excludes final grades received in Bridge courses.
   2. return to studies after having previously been Required to Withdraw.

   The academic standing "Placed on Academic Probation" shall be placed on the student's transcript.

ii. A student under Academic Probation must follow a special program for the next Engineering Session:
   1. Students with an ECGPA less than 1.3, or students returning to studies after being previously Required to Withdraw, must repeat courses specified by the Associate Dean, in consultation with the BTech (MINE) program chair.
   2. The Associate Dean (Academic), in consultation with the BTech (MINE) program chair, may also specify additional probationary conditions to improve the chances of student success. The total course load for the probationary session must not exceed the maximum number of units prescribed for that year of the program.

iii. Any student who is placed on Academic Probation and who fulfills all of their Academic Probation conditions at the time of their next academic standing assessment shall be released from Academic Probation.

iv. If a student is Required to Withdraw at the time of their academic standing assessment but is currently taking a Spring/Summer course at Queen's University, they may complete the term-length course in which they are enrolled, but is then required to withdraw at the end of the term.

#### Requirement to Withdraw, with opportunity to be considered for readmission after one year:

v. A student whose ECGPA is less than 0.7 at the time of the academic standing assessment has failed the year and is required to withdraw for a period of at least one year, and may be considered for readmission only after one year.

vi. A student who is on Academic Probation under Regulation 18.d (i) at the time of assessment and does not fulfill all of their conditions of Academic Probation is required to withdraw for a period of at least one year and may be considered for readmission only after one year. The academic standing "Required to Withdraw for a minimum of one year” shall be placed on the student's transcript.

#### Requirement to Withdraw, with opportunity to be considered for readmission after a minimum of three years:

vii. A student who has failed a previous year, or who has been previously Required to Withdraw for academic reasons, and whose ECGPA at the time of their academic standing assessment is less than 0.7 has failed the year and is required to withdraw for a minimum period of three years, and may be considered for readmission only after a minimum of three years.

viii. A student who is on Academic Probation at the time of assessment, does not fulfill all of their conditions of Academic Probation and has previously been required to withdraw, is required to withdraw for a minimum period of three years, and may be considered for readmission only after a minimum of three years. The academic standing "Required to Withdraw for a minimum of three years" shall be placed on the student's transcript.
18. **Regulations specific to the B.A.Sc. with Professional Internship**

   Students in second or third year of any Engineering program may enroll in a five-year "Bachelor of Applied Science in Engineering Degree program with Professional Internship."

   Students who complete successfully the requirements of the Professional Internship program, upon graduating, will receive the designation "B.A.Sc. with Professional Internship" on their transcript.

   The requirements of the Professional Internship program are:

   a. Students must register in the Queen's University Internship Program and will be enrolled in specific, required Academic Internship courses, depending upon the duration and timing of their internship.

   b. To receive a Professional Internship, students must spend a minimum of 12 months, and a maximum of 16 months on Internship.

   c. Students must fulfill the requirements stipulated by their Employment contract, as well as the requirements stipulated by their Academic Internship courses, listed in the FEAS Calendar.

   d. A student must be in good academic standing (see Regulation 10) to undertake an Internship. The minimum ECGPA requirement at the time of application is 1.9, and a minimum term GPA of 2.0 in the last active term (excluding Summer term).

   e. Undertaking a Professional Internship does not affect in any other way the current academic program of the student – all standard faculty policies apply, with the understanding that students take a minimum of 12 months, and a maximum of 16 months out of their regular academic programs to pursue Professional Internship.

**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
Electronic Information Security Policy Framework

**Awards and Financial Assistance**

**Prospective Students**

Please visit the Awards website.

**Student Financial Assistance**
Student Awards, as part of the Office of the University Registrar, plays a key role in supporting the University's mission. Our goal is to ensure that all students have the opportunity to attend Queen's, regardless of their personal financial circumstances. To achieve this, a variety of funding sources may be required.

The Student Awards Office is responsible for administering all merit-based undergraduate funding and all need-based funding for both undergraduate and graduate students. Merit-based (scholarship) funding recognizes and rewards students for their achievement, both academic and extra-curricular. Need-based funding (bursaries, awards, work study, loans and grants) is disbursed to students on the basis of demonstrated financial need. Listed directly below is general information as it pertains to the various student financial assistance programs administered by the Student Awards Office. For more detailed information please refer to either the Student Awards website or contact the office.

Awards Officers are available throughout the year to provide financial advising on budgeting and the various options available to assist students with financing their Queen's education.

For further Information:

Office of the University Registrar
Student Awards
Gordon Hall, 74 Union Street
Queen's University
Kingston, Ontario, Canada K7L 3N6
Tel: 613-533-2216
Fax: 613-533-6409
E-mail: awards@queensu.ca
Web: http://www.queensu.ca/studentawards/

Government Student Financial Assistance (Loans and Grants)

The federal and provincial governments provide student financial assistance for Canadian citizens, permanent residents, and protected persons studying at the post-secondary level. This assistance is intended to supplement student and family resources and recipients must demonstrate financial need. This assistance is offered in the form of repayable loans and in some cases may also include a limited amount of grant or bursary funding.

The appropriate provincial or territorial authorities will evaluate student applications and will provide funding. Funding options, eligibility criteria and regulations vary by jurisdiction. Students from Ontario will access government student financial assistance through the Ontario Student Assistance Program (OSAP): osap.gov.on.ca. Students from a province or territory outside Ontario must apply for government student financial assistance through their home province or territory.

Other government student financial assistance programs include:

**Canada Study Grant for the Accommodation of Students with Permanent Disabilities**

This program is designed to assist disabled students with disability-related costs of equipment and/or services associated with their participation in post-secondary studies. Students must first apply for funding from their applicable government student financial assistance program for the current academic year and must demonstrate financial need. Students must also be registered with the Health, Counselling and Disability Services Office at Queen's University.

**OSAP Child-Care Bursary**

The OSAP Child-Care Bursary is provided to eligible Ontario students who, in relation to their participation in post-secondary studies, incur child-care costs for three or more children.
Ontario Special Bursary

Ontario students with low income and enrolled in part-time studies (as defined by the government - maximum 59% of a full course load in each term of study) due to family responsibilities or other personal circumstances may be eligible. Students must be enrolled in a program leading to a degree or diploma and generally cannot have a previous post-secondary degree or diploma.

Part-time Canada Student Loan/Canada Study Grant (CSG) Program

Canadian citizens and permanent residents with low income and enrolled in part-time studies (as defined by the government - maximum 59% of a full course load in each term of study) may be eligible. Students must be residents of a province or territory that participates in the Canada Student Loans program. To qualify for the CSG students must be studying part-time due to family responsibilities or other personal circumstances.

Work Study Program

Queen's University and the Government of Ontario fund this program. The objective is to provide an opportunity for students in financial need to receive priority for certain part-time jobs, generally on-campus, during the academic terms. Applications for the Fall-Winter academic session are available in May and applications for the Spring-Summer academic session are available in February.

General Bursaries

Queen's University bursary assistance is granted after the student's own financial contribution to the cost of his/her education, parental assistance, government aid assistance, or a bank line of credit have been exhausted. Financial need is the primary consideration in the granting of a bursary.

In order to be considered for the majority of Queen's bursaries, including the ones specifically pertaining to Engineering and Applied Science students, students need to complete a single General Bursary application form (unless otherwise noted in the terms of the awards), which is available from the Student Awards website. The deadline for this application is 31 October. If a student is not granted an Engineering and Applied Science bursary or award he/she is still eligible to receive General Bursary funds. Funds will be distributed at the beginning of Winter Term. Bursaries and awards are paid to the student's tuition account if a balance is owing, and any remaining funds are paid by cheque or electronic funds transfer. The values of the bursaries and awards are variable, unless otherwise noted. For complete terms of these, and other named bursaries and awards see the Student Awards website.

Short-term Loans

Short-term loans (of 90 days or less) may be granted in emergency situations if a full-time student is experiencing temporary cash-flow difficulties and can provide satisfactory evidence that he/she will have sufficient resources to repay the loan on or before the due date. Short-term loans are approved on the basis of financial need to assist students in meeting those expenses normally incurred in support of attendance at the University during the current academic session.

Entrance Awards

Queen's Entrance scholarships, bursaries and awards are not listed in this Calendar. Details on these awards are available on the Student Awards web-site or in the Viewbook brochure. The Viewbook should be available in the Guidance Offices of secondary schools or may be obtained by writing to the Office of the University Registrar (Admission Services), Queen's University, Kingston, ON K7L 3N6
Scholarships

Queen's upper-year scholarships are generally available to full-time students in their respective faculty/school and who will be returning to full-time studies in the year following the award. For the most part, separate applications are not required. Candidates will be considered for those awards for which they are eligible in competition with all other qualified candidates. In instances where a scholarship application is required, specific instructions about the application process are given in the description of the award.

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For a list of awards and Bursaries available, please visit this link: https://www.queensu.ca/registrar/financial-aid/application-required/current-students/scholarships-awards

Online Undergraduate Courses in Engineering

The Faculty of Engineering and Applied Science (FEAS) at Queen's is committed to providing flexibility and accessibility in our curriculum. As such, we provide one fully online undergraduate program and several fully online courses.

Fully online undergraduate program:

Bachelor of Mining Engineering Technology (online)

Fully online courses available for Bachelor of Mining Technology (BTECH) students (Offered Based on Demand):

- MNTC P01 Engineering Mathematics
- MNTC P02 Mining Geology
- MNTC P03 Foundational Mathematics
- MNTC P04 Calculus
- MNTC P05 Foundational Physics
- MNTC P06 Foundational Chemistry
- MNTC P07 Surveying Principles
- MNTC 313 Introduction to Programming
- MNTC 314 Drilling and Blasting
- MNTC 316 Ventilation and Hydraulics
- MNTC 399 Field School I (on site)
- MNTC 408 Mine Health and Safety
- MNTC 409 Mineral Economics
- MNTC 413 Surface Mine Planning
MNTC 301 Technical Writing and Communication
MNTC 302 Engineering Physics
MNTC 303 Engineering Chemistry
MNTC 304 Applied Metrology and Data Analysis
MNTC 305 Introduction to Mining
MNTC 306 Mineral Processing Unit Operations
MNTC 307 Geomechanics and Ground Control
MNTC 310 Mining and Society
MNTC 311 Ore Body Modelling and Resource Estimation

MNTC 414 Underground Mine Planning
MNTC 415 Metal Extraction Processes
MNTC 418 Sustainability and the Environment
MNTC 419 Mine Supervision and Project Management
MNTC 420 Physical Asset Management
MNTC 423 Geomatics
MNTC 498 Capstone Project
MNTC 499 Field School II (on site)

Fully online courses available for Bachelor of Applied Science (BASC) and Letter of Permission students:

- APSC 221 Economics and Business Practices in Engineering  (Offered Fall, Winter, Summer)
- APSC 250 NOT OFFERED THIS YEAR -Biology Through an Engineering Lens (Offered in Summer online)
- CHEE 302 Technical Entrepreneurship  (Offered in Fall at Herstmonceux Castle and Offered in Winter online)
- MINE 472 Mining Systems, Automation, and Robotics  (Offered in Winter)
- MTHE 225 Ordinary Differential Equations (Offered in Summer)

To apply for registration in an FEAS online course or program:

- Existing Queen's students, please visit SOLUS to enroll.
- Students interested in the BTECH program, please see here
- For non-Queen's undergraduate students applying as a Letter of Permission student, use the Queen's Online Application Portal. See below for further information.

Step-by-Step Letter of Permission Application Guideline for Non-Queen's undergraduate students:

Please follow the step below when applying to Queen's Engineering as a Letter of Permission student:

1. Access the online application portal found here
2. Create an account
3. Under 'External Applicant' select 'Letter of Permission/Non-Degree'
4. Under '1st Program/Plan':
   1. Select 'Non-Degree Faculty of Engineering and Applied Science' as your program
   2. Select 'Engineering Online Letter of Permission' as your plan
   3. Select 'Part Time' as your course load
   4. Indicate the term of study (eg. Summer 2020) under term
5. Enter Personal Details section
6. Review application
7. Attach required documentation
8. Submit application payment
9. Complete Application
10. After you have submitted your application, you will work with the Admissions Office who will review your application and, provided you have accurately completed your application, will issue you an offer of admission.

11. Once you have accepted your offer of admission, the Faculty of Engineering and Applied Science Office will reach out to you to assist you with your course registration.

Application Deadlines for BTECH and Letter of Permission

When the 1st/15th fall on a weekend/holiday the opening/closing/document deadline/ will move to the next business day. Applications open at 8:30 am and close at 4:30 pm EST.

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<thead>
<tr>
<th>Term</th>
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<th>Close</th>
<th>Document/ LOP and Interest Closing</th>
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<tr>
<td>Winter</td>
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<td>Summer</td>
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<td>Fall (ASO)</td>
<td>July 1st</td>
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(ASO: Arts & Science Online)

Important Term Dates

FEAS specific dates: http://calendar.engineering.queensu.ca/content.php?catoid=10&navoid=256

FEAS Sessional dates: Registrar's Office website here

Tuition Fees

Information on tuition fees for Domestic and International students can be found here

Pay Your Tuition

Tuition is generally due on the first day of class. Please make note of the upcoming tuition due dates per term.

To Pay Tuition:

METHOD 1: Credit Card (only available to Distance Students)

- Log in to SOLUS
- Click on the green dollar sign
- Follow the on-screen prompts to complete payment

METHOD 2: Bank Transfer

- Using online or in-person banking, find Queen's University as a Payee
- Use your 8-digit student number as the 'account number'
- Once set up, you can pay this payee using funds directly from your bank account online, in person, or by telephone.
Please note that some payments can take between 3-5 business days to reflect in your Queen's account.
The Office of the Registrar can help with all questions about fees and payments. 613-533-6894 or fees@queensu.ca
Student Awards can help you with questions about OSAP, financial aid, bursaries and awards. 613-533-2216.

**Set up your NetID**

- Your NetID is your login for the Queen's online Student Centre. Once you apply, you will receive an email with your student number. You will use this to create your NetID following these steps:
  - Go to https://my.queensu.ca
  - Click on Don't have a NetID?
  - Under Students, click on Activate your NetID
  - Record your NetID, you will need it every time you log into SOLUS, OnQ and your Queen's email account.

**Access your Queen's Email**

As a Queen's student, you have a permanent Queen's email address that consists of your netid@queensu.ca. All communication from Queen's will go to this email address. Check it frequently or consider forwarding it to your most commonly accessed email address.

- Log in to Queen's Email
  - click on https://outlook.office.com/owa/?realm=queensu.ca
  - enter your Queen's NET ID and password
  - click "log in"

**Access your Courses (OnQ)**

Our online courses are run through OnQ, our online learning platforms.
You will be able to begin your online course on the first day of class (or, in the case of a late enrolment, 48 hours after you enrol in SOLUS) by logging into OnQ. From here you will be able to access the course syllabus, timeline and lesson modules, submit assignments and check your grades. You can also communicate with your instructor, TA, and other students in the course. Your instructor or TA will email you at your Queen's email address within the first week of the term to introduce themselves and the course to you.

- click on https://onq.queensu.ca
- enter your Queen's NET ID and password
- click "log in"

**Credit Transfer:**

You will need to initiate a request at your home university to have the credit transferred – so you should contact your faculty or department regarding the process and regarding how the grade would show on your transcript.

You will also likely need to request an official Queen's transcript be sent from Queen's as proof – please refer to this page for that process:

Please see the Queen's Registrar's pages regarding the process to ordering an official transcript:
Queen's Registrar

Questions can be directed to the registrar's office at:

- transcript@queensu.ca
- Phone: (613) 533-2040