

University of Waterloo
SENATE UNDERGRADUATE COUNCIL
Notice of Meeting

DATE: Tuesday 9 May 2023
TIME: 12:30 p.m. – 2:30 p.m.
PLACE: NH 3318

Open Session

Item	Action
1. Declarations of Conflict of Interest - Excerpt from Senate Bylaw 1*	Information
2. Approval of the 11 April 2023 Minutes* and Business Arising	UGC
3. Curricular Items for Approval & Information	
a. Engineering*	5.1 SEN-C; 5.2, 5.3 Information; rest UGC
b. Math*	UGC
c. Renison*	UGC
d. Software Engineering*	UGC
4. Registrars Office	
a. Course Changes and Regulations*	2 SEN-C; rest UGC
5. Other Business	
6. Next Meeting: Tuesday 12 June 2023, 12:30 to 2:30 p.m. in NH 3318	

*material attached/to be distributed**

“SEN-C” to be recommended to Senate for approval (consent agenda)

“SEN-R” to be recommended to Senate for approval (regular agenda)

“UGC” to be approved on behalf of Senate & sent to Senate for information

3 May 2023

Tim Weber-Kraljevski
Associate University Secretary

Excerpt from Senate Bylaw 1

8. Declarations of conflict of interest

8.01	At the beginning of each meeting of Senate or any of Senate’s committees or councils, the chair will call for members to declare any conflicts of interest with regard to any agenda item. For agenda items to be discussed in closed session, the chair will call for declarations of conflict of interest at the beginning of the closed portion of the meeting. Members may nonetheless declare conflicts at any time during a meeting.
8.02	A member shall be considered to have an actual, perceived or potential conflict of interest, when the opportunity exists for the member to use confidential information gained as a member of Senate, or any of Senate’s committees or councils, for the personal profit or advantage of any person, or use the authority, knowledge or influence of the Senate, or a committee or council thereof, to further her/his personal, familial or corporate interests or the interests of an employee of the university with whom the member has a marital, familial or sexual relationship.
8.03	Members who declare conflicts of interest shall not enter into debate nor vote upon the specified item upon which they have declared a conflict of interest. The chair will determine whether it is appropriate for said member to remove themselves from the meeting for the duration of debate on the specified item(s).
8.04	Where Senate or a committee or council of Senate is of the opinion that a conflict of interest exists that has not been declared, the body may declare by a resolution carried by two-thirds of its members present at the meeting that a conflict of interest exists and a member thus found to be in conflict shall not enter into debate on the specified item upon which they have declared a conflict of interest. The chair will determine whether it is appropriate for said member to remove themselves from the meeting for the duration of debate on the specified item(s).

University of Waterloo
SENATE UNDERGRADUATE COUNCIL
Minutes of the 11 April 2023 Meeting
[in agenda order]

Present: Katherine Acheson, Janice Aurini, Veronica Austen, Monica Barra, Benoit Charbonneau, Victoria Chu, Vivian Dayah, David DeVidi (Chair), Leeann Ferries, Fatma Gzara, Carol Ann MacGregor, Kristiina Montero, Catherine Newell Kelly, Ryan Trelford, Chris Vigna, Johanna Wandel, Tim Weber-Kraljevski (secretary), Richard Wikkerink, Mike Wood, Stephanie Ye-Mowe

Regrets: Jason Grove

Resources/Guests: Angela Christelis, Jennifer Coghlin, Danielle Jeanneault, Carrie MacKinnon

Organization of Meeting: David DeVidi took the chair, and Tim Weber-Kraljevski acted as secretary. The secretary advised that a quorum was present. The agenda was approved without formal motion.

The chair recognized Stephanie Ye-Mowe last meeting and thanked. Chris Vigna reappointed.

1. DECLARATIONS OF CONFLICTS OF INTEREST

No conflicts of interest were declared.

2. APPROVAL OF THE 7 MARCH 2023 MINUTES AND BUSINESS ARISING

The following revisions were requested: add Vivian Dayah to the regrets; and under Item 3 for Liberal Studies replace “the change in student demographics...program” with “the increasing enrolment, and the popularity of the Honours option (introduced in 2019) and the co-op option (introduced in 2020)”. The minutes were approved with the revisions without formal motion. There was no business arising from the minutes.

3. CURRICULAR ITEMS FOR APPROVAL & INFORMATION

Arts. Acheson presented the following new courses: BLKST 242, MEDVL 492, FINE 260, ITALST 242, and ITALST 261. Members discussed: growth within the Italian Studies department; and the opportunity to introduce the course BLKST 242 as part of a larger move to introduce more Black Studies courses. There was a motion to approve the new courses on behalf of Senate, as presented. Acheson and Montero. Carried. Acheson provided an overview of courses changes for Conrad Grebel University College, Classical Studies, Fine Arts, Germanic & Slavic Studies, Psychology, Renison University College, Religious Studies, Spanish & Latin American Studies, and St. Jerome's University. There was a motion to approve the course changes on behalf of Senate, as presented. Acheson and MacGregor. Carried. Acheson presented course inactivations for the School of Accounting and Finance. There was a motion to approve the course inactivations on behalf of Senate, as presented. Acheson and Ferries. Carried. Acheson provided an overview of the minor academic plan changes in Medieval Studies/St. Jerome's University, Dean of Arts, French Studies, Philosophy, and St. Jerome's University. There was a motion to approve the minor academic plan changes behalf of Senate, as presented. Acheson and Austen. Carried.

Health. Ferries presented new course KIN 387 and course changes for the School of Public Health Sciences, and Kinesiology and Health Sciences. There was a motion to approve the new course and course changes on behalf of Senate, as presented. Ferries and MacGregor. Carried. Ferries provided an overview of the minor academic plan changes for the Honours Kinesiology co-op sequence, Rehabilitation Sciences Specialization, Bachelor of Science, Honours Health Sciences, Bachelor of Public Health, Honours, Health Research Specialization, Gerontology Minor, Aging Studies Option, and Diploma in Gerontology. Ferries highlighted a revision in the material provided for the Diploma in Gerontology academic plan change, that the calendar text should read “Students registered in degree programs or any non- or post-degree academic plan may pursue the Diploma in Gerontology...” instead of “Diploma in Black Studies”. Members discussed the back-to-back work-terms in the proposed changes to the Honours Kinesiology Co-op sequence. There was a motion to approve the minor

academic plan changes behalf of Senate, with the revision. Ferries and Wikkerink. Carried. Ferries spoke to the proposed regulation revision for second degree and degree upgrade for the Faculty of Health. Members discussed: the original rationale for the requirement being removed that students wishing an upgrade return the earlier degree; and the process for courses in a first degree to count to a second degree. There was a motion to recommend that Senate approve the academic regulation revision, as presented. Ferries and Charbonneau. Carried.

Mathematics. Charbonneau presented course changes for CS 335, CS 346, CS 445, PMATH 440, and PMATH 453, and minor academic plan changes for the Software Engineering Specialization and the Mathematics Minor. There was a motion to approve the course changes and minor academic plan changes behalf of Senate. Charbonneau and Barra. Carried. Charbonneau provided an overview of the minor calendar change for admission. There was a motion to approve the minor calendar change behalf of Senate, as presented. Charbonneau and Ferries. Carried. Charbonneau presented for information the change that the administration of the Mathematics/Chartered Professional Accountancy and Mathematics/Financial Analysis and Risk Management (FARM) is being moved from the Dean of Mathematics to be administered by the Department of Statistics and Actuarial Science.

Science. Barra presented course changes in Chemistry, Pharmacy, and Physics. There was a motion to approve the course changes on behalf of Senate, as presented. Barra and MacGregor. Carried. Barra presented a minor academic plan change in Honours Science and Aviation and the major academic plan change of the closure of application to part-time on-campus Three-Year General Science program. There was a motion to approve the minor academic plan change on behalf of Senate and to recommend Senate approve the major academic plan change, as presented. Barra and Acheson. Carried.

4. REGISTRAR'S OFFICE

Newel Kelly presented the Effective Dates Chart for information.

5. SENATE GOVERNANCE REVIEW

The chair provided an overview of the Sketch of SUC Subcommittees document, highlighting the changes made based on feedback by members. Members discussed: concerns about lack of AFIW membership on the proposed Academic Quality Assurance Committee; concerns about not all Faculties being represented on the proposed Academic Quality Assurance Committee; the proposed process for FAR/Two-year reports; revisions to the IQAP process; and the role and responsibilities of the Council should the new subcommittee and committee be approved. There was a endorse the recommendation to Senate for the new Subcommittee of Council, Curriculum and New Program Approvals, as presented. MacGregor and Ferries. Carried. The chair proposed a revision to the membership of the proposed new Senate Committee, Academic Quality Assurance Committee, to increase the additional faculty from Senate Undergraduate Council from two to three, and to increase the additional faculty from Senate Graduate and Research Council from two to three, to ensure representation from each Faculty. There was a motion to endorse the recommendation to Senate for the new Senate Committee, Curriculum and New Program Approvals, with the revision. Charbonneau and Ferries. Carried with two abstentions.

6. OTHER BUSINESS

There was no other business.

7. NEXT MEETING

The next meeting is Tuesday 9 May 2023, 12:30 to 2:30 p.m. in NH 3318

2 May 2023

Tim Weber-Kraljevski
Associate University Secretary

May 9, 2023

TO: Tim Weber-Kraljevski, Associate University Secretary, Secretariat

FROM: Jason Grove, Associate Dean, Undergraduate Studies, Faculty of Engineering

SUBJECT: Items for Approval at May 9, 2023 Senate Undergraduate Council

ALL CHANGES ARE EFFECTIVE SEPTEMBER 2024 UNLESS OTHERWISE NOTED.

- 1. New Courses** [for approval]
 - 1.1 Management Engineering (MSCI 232)

- 2. Course Changes** [for approval]
 - 2.1 Management Engineering (MSCI 331, 332, 431, 434, 435, 442, 454, 555)

- 3. Course In-activations** [for approval]
 - 3.1 School of Architecture (ARCH 174, 175, 215, 256, 274, 275, 277, 284, 285, 314, 328, 331, 345, 347, 374, 375, 384, 385, 443, 474, 475)

- 4. Academic Plans (Minor Modifications)** [for approval]
 - 4.1 Examinations and Promotions
 - 4.2 Rules
 - 4.3 School of Architecture
 - 4.4 Chemical Engineering
 - 4.5 Geological Engineering
 - 4.6 Management Engineering
 - 4.7 Computing Option
 - 4.8 Computer Engineering Option
 - 4.9 Management Sciences Option
 - 4.10 Software Engineering Option
 - 4.11 Complementary Studies Electives

5. Other

5.1 Admissions

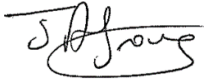
[for approval]

5.2 Temporary Calendar Deviations due to the Pandemic

[for Information]

5.3 Appendix: Calendar Descriptions

[for information]

A handwritten signature in black ink, appearing to read "J. Grove". The signature is written in a cursive style with a horizontal line underneath the name.

Jason Grove
Associate Dean, Undergraduate Studies
Faculty of Engineering

NEW COURSES (for approval)

Management Sciences

Effective 01-SEP-2024

MSCI 232 (0.50) LAB, LEC Modelling in Operations Research

This course uses a quantitative approach to problem solving using mathematical modelling, solution by solver, and output and sensitivity analysis. Students learn how to analyze and solve decision problems in management and engineering systems following the engineering process: understanding the problem, identifying appropriate models and solution methods, formulating and structuring the model, and interpreting the results. The course covers linear, integer, and nonlinear, optimization modelling and dynamic programming. [Offered: F, first Offered: Spring 2026].

Requisites :	Prereq: Level 2B Management Engineering
Anitreq:	MSCI 331
Rationale :	Optimization modelling and solution methods were covered at different levels in MSCI 331 and MSCI 332. One of the main learning outcomes (modelling) has not been met as planned. The revision aims to have a course focused on the model building process which is a fundamental skill for Management Engineering students.
Short title:	Modelling Operations

End of Report

COURSE CHANGES (for approval)

Current Catalog Information

MSCI 331 (0.50) LEC, TUT Introduction to Optimization

This first course in optimization uses a quantitative approach to problem solving involving, mathematical modelling and formulations, solution methods, and output analysis. Students are introduced to a variety of practical problem formulations in management and engineering, a number of solution methods, including, but not limited to, linear optimization, network models, project management, and decision analysis.

Students are also involved in a group project, where they go through conceptual and operational model design, analytical solution, output analysis, and recommendation. [Offered: F,W,S]

No Special Consent Required

Requisites : Prereq: Not open to students in the Faculty of Mathematics except for Software Engineering. Antireq: BME 411, CHE 521, CIVE 332, CO 250, ENVE 320/335, SYDE 411

Effective 01-SEP-2024

Requisite Change : Prereq: Not open to [Management Engineering students](#) or students in the Faculty of Mathematics except for Software Engineering.

Antireq: BME 411, CHE 521, CIVE 332, CO 250, ENVE 320/335, [MSCI 232](#), SYDE 411

Rationale : MSCI 232 is a new course that will be offered in 2B instead of MSCI 311 in the Management Engineering curriculum. The content of the courses are similar other than modeling is taught as a core course earlier in the curriculum.

Current Catalog Information

MSCI 332 (0.50) LEC, TUT Deterministic Optimization Models and Methods

This course builds on the material presented in MSCI 331, and explores more advanced optimization techniques and applications. Methods, such as integer optimization, dynamic programming, and heuristics, are introduced and used to design solution alternatives for applications from management engineering. This may include network and process design in logistics, transportation, telecommunications, and healthcare. [Offered: F]

No Special Consent Required

Requisites : Prereq: One of BME 411, CHE 521, CIVE 332, CO 250, ENVE 320, 335, MSCI 331, SYDE 411. Antireq: CO 327

Effective 01-SEP-2024

Title Change: [Fundamentals of Optimization](#)

Description Change:

This course focusses on solution methods in linear, integer, and nonlinear optimization. Topics include the theory and algorithms of linear optimization, branch-and-bound, network algorithms, convexity, and optimality conditions [Offered: F]

Requisites : Prereq: One of BME 411, CHE 521, CIVE 332, CO 250, ENVE 320, 335, MSCI [232](#), 331, SYDE 411

Antireq: CO 327

Rationale : MSCI 232 is a new core course and will be offered in 2B in place of MSCI 311 in the Management Engineering curriculum, therefore the title, description and prerequisites of MSCI 332 are being updated to reflect proper content sequence.

Short title: Fund. of Optimization

Current Catalog Information

MSCI 431 (0.50) LEC, TUT Stochastic Models and Methods

Introduction to operations research models and methods for problems with random, stochastic, and probabilistic components. Topics include birth and death processes, branching processes, waiting line models, and Markov decision processes. Applications include the design, modelling, and analysis of service and manufacturing systems, with emphasis on important functions such as queueing, inventory, reliability, equipment replacement, and maintenance. [Offered: W]

No Special Consent Required

Requisites : Prereq: (One of BME411, CHE521, CIVE332, CO250, ENVE335, MSCI331, SYDE411) and (One of AE224, BME213, CHE220, CIVE224, ECE203, ECE306, ENVE224, MSCI251, MSCI252, ME202, MTE201, NE215, STAT206 ,211 ,231, 241, SYDE212); Not open to Math students except SE.

Antireq: STAT333

Effective 01-SEP-2024

Requisite Change : Prereq: (One of BME411, CHE521, CIVE332, CO250, ENVE335, [MSCI232](#), MSCI331, SYDE411) and (One of AE224, BME213, CHE220, CIVE224, ECE203, ECE306, ENVE224, MSCI251, 252, ME202, MTE201, NE215, STAT206, 211, 231, 241, SYDE212); Not open to Math students except for Software Engineering.
Antireq: STAT333

Rationale : The requisite is being updated to reflect MSCI 232 being offered in 2B instead of MSCI 311 in the Management Engineering curriculum.

Current Catalog Information

MSCI 434 (0.50) LAB, LEC, TUT Supply Chain Management

This course focuses on the efficient use of material, information, physical and human capital resources in supply-demand networks consisting of suppliers, manufacturers, distributors, retailers and customers. It emphasizes analytic tools used to design, implement and sustain competitive

supply chain systems. The material will highlight application of supply chain practices in industry and supply chain implementation challenges. Issues associated with international or global supply chains will be discussed.

[Offered: S]

No Special Consent Required

Requisites : Prereq: MSCI 334 or 432; Level at least 4A Management Engineering

Effective 01-SEP-2024

Component Change: ~~LAB~~, LEC, TUT

Rationale : The lab is being removed to make space in the curriculum for a lab in MSCI 232

Current Catalog Information

MSCI 435 (0.50) LEC, TUT Advanced Optimization Techniques

This course covers advanced topics in optimization such as constraint programming, stochastic programming, large scale optimization, or complementarity problems.

[Offered: W]

No Special Consent Required

Requisites : Prereq: MSCI 332

Effective 01-SEP-2024

Description Change: This course covers more advanced topics in optimization that go beyond the contents of MSCI [232](#), MSCI 331, and MSCI 332. The course will cover topics such as constraint programming, stochastic programming, large scale optimization, or complementarity problems. [Offered: W]

Rationale : The description is being updated as MSCI 232 is being added to the Management Engineering curriculum

Current Catalog Information

MSCI 442 (0.50) LEC Impact of Information Systems on Organizations and Society

This course is designed to familiarize the student with issues related to the impact of computer-based technologies on individual jobs, organizations, and broader societal level. Particular emphasis will be placed on critical examination of various issues including privacy, security, ethical concern and professional responsibilities. [Offered: W,S]

No Special Consent Required

Requisites : Prereq: Level at least 3A Engineering

Effective 01-SEP-2024

Requisite Change : Prereq: ~~Level at least 3A Engineering~~

Rationale : The prerequisite "level at least 3A engineering" is being removed as it is not necessary.

Current Catalog Information

MSCI 454 (0.50) LEC Technical Entrepreneurship

Technical entrepreneurship is examined considering the role of independent business, entrepreneurial behaviour, types of business and enterprises, business structure, sources of venture concepts and capital, company operation and control, and business start up. [Offered: W]

No Special Consent Required

Requisites : Prereq: Level at least 3A

Effective 01-SEP-2024

Requisite Change : Prereq: ~~Level at least 3A~~

Rationale : The prerequisite “Level least 3A” is being removed as it is not necessary.

Current Catalog Information

MSCI 555 (0.50) LEC, TUT Scheduling: Theory and Practice

Scheduling is the sequencing of tasks to scarce resources. By exploring scheduling problems found in industry, this course will discuss scheduling framework and notation as well as algorithmic, heuristic, and mathematical programming solution approaches. Students will be introduced to the theoretical background in these areas, but the emphasis will be placed on modeling and solving scheduling problems in practice. Students will apply these concepts in design activities in assignments and a course project. [Offered: W]

No Special Consent Required

Requisites : Prereq: One of BME 411, CHE 521, CIVE 332, CO 250, ENVE 320, 335, MSCI 331, SYDE 411. Antireq: CO 454

Effective 01-SEP-2024

Requisite Change : Prereq: One of BME 411, CHE 521, CIVE 332, CO 250, ENVE 320, 335, MSCI 232, MSCI 331, SYDE 411. Antireq: CO 454

Rationale : The requisite is being updated to reflect MSCI 232 being offered in 2B instead of MSCI 311 in the Management Engineering curriculum.

COURSE INACTIVATIONS (for approval)

Architecture - School of

Effective 01-SEP-2024
ARCH 174 (0.50)
Rationale :

Experimental Course

The course has not been offered since 2005 and there are no plans to offer it in future

Effective 01-SEP-2024
ARCH 175 (0.50)
Rationale :

Experimental Course

The course has not been offered since 2005 and is not to be offered in future.

Effective 01-SEP-2024
ARCH 215 (0.50)
Rationale :

Communication Design

This course has not been offered for many years and is not planned for any future offerings

Effective 01-SEP-2024
ARCH 256 (0.50)
Rationale :

Introduction to Photography

This course has not been offered for many years and is not planned for any future offerings

Effective 01-SEP-2024
ARCH 274 (0.50)
Rationale :

Experimental Course

This course has not been offered since 2005 and is not to be offered in future

Effective 01-SEP-2024
ARCH 275 (0.50)
Rationale :

Experimental Course

This course has not been offered since 2005 and is not to be offered in future

Effective 01-SEP-2024
ARCH 277 (0.50)
Rationale :

Timber: Design, Structure and Construction for Engineers

Engineering now has their own version of this course with launch of Architectural Engineering program. Therefore, it is no longer necessary to offer this course to engineering students. This would remain an anti-requisite to any CIVE students who took this course until they have graduated.

Effective 01-SEP-2024
ARCH 284 (0.50)
Rationale :

Architectural Research

The course is not required as it is felt that independent research at School of Architecture is best served by the masters thesis.

We are maintaining Arch 484 and Arch 485 in operation to allow for independent research to continue for exceptional students who are further along in their education

Effective 01-SEP-2024
ARCH 285 (0.50)
Rationale :

Architectural Research

The course is not required as it is felt that independent research at School of Architecture is best served by the masters thesis.

We are maintaining Arch 484 and Arch 485 in operation to allow for independent research to continue for exceptional students who are further along in their education

Effective 01-SEP-2024
ARCH 314 (0.50)
Rationale :

Digital Design

This course has not been offered for many years and is not planned for any future offerings

Effective 01-SEP-2024
ARCH 328 (0.50)
Rationale :

Approaches to Architecture and Urbanism

This course has not been offered for many years and is not planned for any future offerings

Effective 01-SEP-2024
ARCH 331 (0.50)
Rationale :

Working with Wood

This course has not been offered for many years and is not planned for any future offerings

Effective 01-SEP-2024
ARCH 345 (0.50)
Rationale :

Architectural Theory 1850-1990

This course has not been offered for many years and is not planned for any future offerings. This course appears on lists within the Visual Culture plan and minor. Department has been consulted to the inactivation.

Effective 01-SEP-2024
ARCH 347 (0.50)
Rationale :

Philosophy in Architecture

This course has not been offered for many years and is not planned for any future offerings

Effective 01-SEP-2024

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ARCH 374 (0.50)
Rationale :

Experimental Course

This course has not been offered since 2005 and is not to be offered in future

Effective 01-SEP-2024
ARCH 375 (0.50)
Rationale :

Experimental Course

This course has not been offered since 2005 and and is not likely to be offered in future

Effective 01-SEP-2024
ARCH 384 (0.50)
Rationale :

Architectural Research

The course is not required as it is felt that independent research at School of Architecture is best served by the masters thesis.

We are maintaining Arch 484 and Arch 485 in operation to allow for independent research to continue for exceptional students who are further along in their education

Effective 01-SEP-2024
ARCH 385 (0.50)
Rationale :

Architectural Research

The course is not required as it is felt that independent research at School of Architecture is best served by the masters thesis.

We are maintaining Arch 484 and Arch 485 in operation to allow for independent research to continue for exceptional students who are further along in their education

Effective 01-SEP-2024
ARCH 443 (0.50)
Rationale :

Architecture and Film

This course has not been offered for many years and is not planned for any future offerings

Effective 01-SEP-2024
ARCH 474 (0.50)
Rationale :

Experimental Course

This course has not been offered since 2005 and is not likely to be offered in future

Effective 01-SEP-2024
ARCH 475 (0.50)
Rationale :

Experimental Course

The course has not been offered since 2005 and is not planned for future offerings

End of Report

4. Academic Plans (Minor Modifications)

4.1 Examinations and Promotions

Summary:

Editorial Changes

Background & Rationale

Revised text to emphasize the definition of reduced load and timeline to pass the dropped course

Introduction

MARK UP

Bachelor of Applied Science (BASc) and Bachelor of Software Engineering (BSE) Students

The Faculty of Engineering (and Faculty of Mathematics for BSE students) constitutes the examining body for all examinations and is responsible for all decisions on grades, promotions, failures, deferred examinations, appeals, and recommendations for the granting of degrees. Authority in these matters is delegated to the Engineering Examinations and Promotions Committee. Students are examined and grades are set for individual courses on the completion of work for those courses. Upon examination of the student's performance at the end of each term, the Engineering Examinations and Promotions Committee assigns an academic decision.

BASc and BSE Promotion

Course Load

Normally, students are expected to enrol in a full-load term where they will take the number of courses specified by their plan. Students may reduce their load with the approval of their academic advisor. If extenuating circumstances are present, students should discuss their situation with their academic advisor, [AccessAbility Services](#), or [Campus Wellness](#) (including [Counselling Services](#) and [Health Services](#)).

Reduced Load

In a reduced-load 1A term, students are permitted to drop two plan-specific courses with the approval of their academic advisor. Students on a reduced-load 1A term will complete their 1A term requirements during a second reduced-load 1A term. Students who complete their 1A term requirements in two successful reduced-load 1A terms join the 1B class in their plan one year after the 1B term that they would have qualified for had they completed 1A in one full-load term. The exact timing of the reduced-load term is dependent on the students' plan. Students should discuss this alternative with an academic advisor prior to requesting a reduced load.

~~In 1B and above, students are allowed to drop one elective course per term with the approval of their academic advisor.~~

In 1B and above, a student may take a reduced load, with approval of their academic advisor, by dropping one elective or one designated non-elective course (as defined by their plan) per term; dropped courses must be passed prior to graduation.

Calculation of Term Averages and Course Grades

Term average: The primary factor in academic decisions in Engineering. The minimum

passing average is 60%. The minimum average to remain in an Engineering plan is 50%. The term average is calculated using the weight of the course, the status of the course (e.g., Degree Requirement [in failure count] Not in Average [DRNA]) and the interpreted course grade. All grades above 32 are interpreted as the submitted grade. Courses with a submitted grade below 32 are interpreted, for averaging purposes, as having a value of 32.

Course grade: A secondary factor in academic decisions in Engineering. The minimum passing course grade is 50%. A course for which the grade is below this is a failed course. The term "required courses" will be used to denote those courses which are required for the degree. Required courses that are dropped or failed must be successfully passed, or approved replacement courses passed, prior to graduation.

Dropped and Failed Courses

Some dropped or failed courses (type blank and DRNA courses as per [Rule 3](#)) may be carried forward unless a student accumulates a total of three such courses, at which time a student May Not Proceed until they have cleared the courses (by passing the course, replacing the course, or in some cases passing a supplemental examination) as described in [Rule 6](#). The cumulative number of dropped and failed courses of type blank or DRNA is referred to as the To Be Cleared (TBC) count. Other failed courses (type Degree Requirement [not in TBC count] Not in Average [DRNC] courses as per [Rule 1](#)) must be passed by a certain point in a students' plan or a May Not Proceed decision will be applied (see [Rule 12](#)). The due date for completion of such courses is referred to as the completion date. Courses that are failed but not required for a students' plan do not have to be cleared.

The minimum requirements in a full-load term (except in a repeat term) for an academic decision which permits a student to proceed to the next term are a passing term average of 60%, a TBC count of less than three and no DRNC courses that have a grade less than 50 and have passed their completion date.

Repeated Term

If a term is being repeated, the minimum requirements to remain in their engineering plan are a term average of at least 60% and no grades below 50% for courses included in the term average.

Passing Failed or Dropped Required Courses

Failed and dropped required courses may be passed by one of the actions listed below. The department or board responsible for the student's plan of study will decide which mechanism is appropriate on a case-by-case basis.

- For a failed course:
 1. By obtaining a grade of 50% or more for the course based on the outcome of a supplemental examination for which there is a fee. Supplemental examinations may not be available for all courses. The associate chair for undergraduate studies is responsible for administering the supplemental examination and for determining the final supplemental grade to be assigned for the course. If a supplemental exam is permitted to clear the course, but has not yet been taken, a note of "Supplementary Exam Allowed" is provided on the transcript. When a supplemental examination is passed, the note is modified to "Satisfied" on the transcript. If the supplemental exam is not passed then a grade of "Not Satisfied" is associated with the supplementary exam on the transcript. Only one attempt at a supplemental examination is allowed; if this is not successful, the student must retake the course or, if appropriate, take an equivalent course approved by the department.
 2. By retaking the course, taking an equivalent course approved by the department or board or, especially for elective courses, taking an approved replacement course and obtaining a grade of 50% or more for the course. When a failed course has been successfully retaken or replaced, "Fail Cleared" is added on the transcript as a note. A retaken or replacement course also appears on the transcript in the normal fashion. If a grade of less than 50% is obtained for a retaken or replacement

course, see [Rule 6](#) and [Rule 9](#).

- For a dropped course:
 1. By taking the course during a non-academic term and obtaining a grade of 60% or more for the course.
 2. By taking the course during an academic term, obtaining a grade of 50% or more, and including it in the term average.

All failed or dropped required courses must be passed prior to graduation. It is in the best interest of students to pass failed or dropped required courses as soon as possible. Students may not accumulate more than two TBC courses and continue in the plan. A student who obtains a passing term average but has accumulated three or more TBC courses will not be permitted to proceed to the next term; normally, a student will be required to enrol instead for a non-degree term to pass some or all of the TBC courses. Only after the number of TBC courses still uncleared is reduced to one or none will the student be permitted to proceed to the next degree term.

Introduction

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Bachelor of Applied Science (BASc) and Bachelor of Software Engineering (BSE) Students

The Faculty of Engineering (and Faculty of Mathematics for BSE students) constitutes the examining body for all examinations and is responsible for all decisions on grades, promotions, failures, deferred examinations, appeals, and recommendations for the granting of degrees. Authority in these matters is delegated to the Engineering Examinations and Promotions Committee. Students are examined and grades are set for individual courses on the completion of work for those courses. Upon examination of the student's performance at the end of each term, the Engineering Examinations and Promotions Committee assigns an academic decision.

BASc and BSE Promotion

Course Load

Normally, students are expected to enrol in a full-load term where they will take the number of courses specified by their plan. Students may reduce their load with the approval of their academic advisor. If extenuating circumstances are present, students should discuss their situation with their academic advisor, [AccessAbility Services](#), or [Campus Wellness](#) (including [Counselling Services](#) and [Health Services](#)).

Reduced Load

In a reduced-load 1A term, students are permitted to drop two plan-specific courses with the approval of their academic advisor. Students on a reduced-load 1A term will complete their 1A term requirements during a second reduced-load 1A term. Students who complete their 1A term requirements in two successful reduced-load 1A terms join the 1B class in their plan one year after the 1B term that they would have qualified for had they completed 1A in one full-load term. The exact timing of the reduced-load term is dependent on the students' plan. Students should discuss this alternative with an academic advisor prior to requesting a reduced load.

In 1B and above, a student may take a reduced load, with approval of their academic advisor, by dropping one elective or one designated non-elective course (as defined by their plan) per term; dropped courses must be passed prior to graduation.

Calculation of Term Averages and Course Grades

Term average: The primary factor in academic decisions in Engineering. The minimum passing average is 60%. The minimum average to remain in an Engineering plan is 50%. The term average is calculated using the weight of the course, the status of the course (e.g., Degree Requirement [in failure count] Not in Average [DRNA]) and the interpreted course grade. All grades above 32 are interpreted as the submitted grade. Courses with a submitted grade below 32 are interpreted, for averaging purposes, as having a value of 32.

Course grade: A secondary factor in academic decisions in Engineering. The minimum passing course grade is 50%. A course for which the grade is below this is a failed course. The term "required courses" will be used to denote those courses which are required for the degree. Required courses that are dropped or failed must be successfully passed, or approved replacement courses passed, prior to graduation.

Dropped and Failed Courses

Some dropped or failed courses (type blank and DRNA courses as per [Rule 3](#)) may be carried forward unless a student accumulates a total of three such courses, at which time a student May Not Proceed until they have cleared the courses (by passing the course, replacing the course, or in some cases passing a supplemental examination) as described in [Rule 6](#). The cumulative number of dropped and failed courses of type blank or DRNA is referred to as the To Be Cleared (TBC) count. Other failed courses (type Degree Requirement [not in TBC count] Not in Average [DRNC] courses as per [Rule 1](#)) must be passed by a certain point in a students' plan or a May Not Proceed decision will be applied (see [Rule 12](#)). The due date for completion of such courses is referred to as the completion date. Courses that are failed but not required for a students' plan do not have to be cleared.

The minimum requirements in a full-load term (except in a repeat term) for an academic decision which permits a student to proceed to the next term are a passing term average of 60%, a TBC count of less than three and no DRNC courses that have a grade less than 50 and have passed their completion date.

Repeated Term

If a term is being repeated, the minimum requirements to remain in their engineering plan are a term average of at least 60% and no grades below 50% for courses included in the term average.

Passing Failed or Dropped Required Courses

Failed and dropped required courses may be passed by one of the actions listed below. The department or board responsible for the student's plan of study will decide which mechanism is appropriate on a case-by-case basis.

- For a failed course:
 1. By obtaining a grade of 50% or more for the course based on the outcome of a supplemental examination for which there is a fee. Supplemental examinations may not be available for all courses. The associate chair for undergraduate studies is responsible for administering the supplemental examination and for determining the final supplemental grade to be assigned for the course. If a supplemental exam is permitted to clear the course, but has not yet been taken, a note of "Supplementary Exam Allowed" is provided on the transcript. When a supplemental examination is passed, the note is modified to "Satisfied" on the transcript. If the supplemental exam is not passed then a grade of "Not Satisfied" is associated with the supplementary exam on the transcript. Only one attempt at a supplemental examination is allowed; if this is not successful, the student must retake the course or, if appropriate, take an equivalent course approved by the department.
 2. By retaking the course, taking an equivalent course approved by the department or board or, especially for elective courses, taking an approved replacement course and obtaining a grade of 50% or more for the course. When a failed course has been successfully retaken or replaced, "Fail Cleared" is added on the transcript as a note. A retaken or

replacement course also appears on the transcript in the normal fashion. If a grade of less than 50% is obtained for a retaken or replacement course, see [Rule 6](#) and [Rule 9](#).

- For a dropped course:
 1. By taking the course during a non-academic term and obtaining a grade of 60% or more for the course.
 2. By taking the course during an academic term, obtaining a grade of 50% or more, and including it in the term average.

All failed or dropped required courses must be passed prior to graduation. It is in the best interest of students to pass failed or dropped required courses as soon as possible. Students may not accumulate more than two TBC courses and continue in the plan. A student who obtains a passing term average but has accumulated three or more TBC courses will not be permitted to proceed to the next term; normally, a student will be required to enrol instead for a non-degree term to pass some or all of the TBC courses. Only after the number of TBC courses still uncleared is reduced to one or none will the student be permitted to proceed to the next degree term.

4.2 Rules

Summary:

Editorial Changes

Background & Rationale

There was some wording conversations describing the elective reduced-load concept in the calendar that could be tweaked to better align with broader application of flexibility for terminal courses. The relevant calendar text is indicated below.

Rules

MARK UP

The following rules are applied when students' performance is assessed; unless otherwise stated the rules apply to reduced-load 1A, reduced-load, and full-load terms.

- ~~All (full-load) students are expected to enrol in at least the number of courses specified in this Calendar for the corresponding term of their plan. A reduced-load student may drop one elective course per term (as defined by their plan) by obtaining the approval of their academic advisor. These are the courses used to calculate the term average, which is the basis of promotion decisions.~~ All (full-load) students are normally expected to enrol in at least the number courses specified in this Calendar for the corresponding term of their plan. However, a student may take a reduced load, with approval of their academic advisor, by dropping one elective or one designated non-elective course (as defined by their plan) per term; dropped courses must be passed prior to graduation. The courses enrolled in during the term are used to calculate the term average, which is the basis of promotion decisions. Courses not included in the degree, term average, or failure count must be identified at the time of enrolment (see Rule 12). See Rule 16 for information regarding changing a course's designation. The designation of these courses may be changed (with the approval of the department) at any time prior to four weeks before the first day of the Final Examination Period for that term. Reduced-load 1A students must enrol in three courses (a load of at least 1.5 and normally less than a full load) as specified by their academic advisor. Normally, the reduced-load 1A term will be composed of at least two core courses from the 1A term with other courses specified by the academic advisor in consultation with the student.
- The term decision is based on the student's course load during the term, the previous term decision, the term average for the current term, and the number of courses taken that term with grades below 50. The term average is calculated using the weight of the course, the status of the course (e.g., DRNA), and the interpreted course grade. All grades above 32 are interpreted as the submitted grade. Courses with a submitted grade below 32 are interpreted for averaging purposes, as having a value of 32. Both the number of courses below 50 in the current term as well as the cumulative number of To Be Cleared courses (the TBC count) on a student's record can be part of the decision.

Full- and reduced-load terms (excluding reduced-load 1A terms):

.....

Rules

CLEAN COPY

The following rules are applied when students' performance is assessed; unless otherwise stated the rules apply to reduced-load 1A, reduced-load, and full-load terms.

- All (full-load) students are normally expected to enrol in at least the number courses specified in this Calendar for the corresponding term of their plan. However, a student may take a reduced load, with approval of their academic advisor, by dropping one elective or one designated non-elective course (as defined by their plan) per term; dropped courses must be passed prior to graduation. The courses enrolled in during the term are used to calculate the term average, which is the basis of promotion decisions. Courses not included in the degree, term average, or failure count must be identified at the time of enrolment (see Rule 12). See Rule 16 for information regarding changing a course's designation. The designation of these courses may be changed (with the approval of the department) at any time prior to four weeks before the first day of the Final

Examination Period for that term. Reduced-load 1A students must enrol in three courses (a load of at least 1.5 and normally less than a full load) as specified by their academic advisor. Normally, the reduced-load 1A term will be composed of at least two core courses from the 1A term with other courses specified by the academic advisor in consultation with the student.

2. The term decision is based on the student's course load during the term, the previous term decision, the term average for the current term, and the number of courses taken that term with grades below 50. The term average is calculated using the weight of the course, the status of the course (e.g., DRNA), and the interpreted course grade. All grades above 32 are interpreted as the submitted grade. Courses with a submitted grade below 32 are interpreted for averaging purposes, as having a value of 32. Both the number of courses below 50 in the current term as well as the cumulative number of To Be Cleared courses (the TBC count) on a student's record can be part of the decision.

Full- and reduced-load terms (excluding reduced-load 1A terms):

.....

4.3 School of Architecture

Summary:

1. Minor Modification

Update the suite of elective offerings

2. Course Changes

- a) Inactivate experimental courses (ARCH174, ARCH175, ARCH274, ARCH 275, ARCH374, ARCH375, ARCH474 & ARCH475)
- b) Inactivate architectural research courses (ARCH284, ARCH285, ARCH384 & ARCH 385)
- c) Inactivate elective courses ARCH215 (Communication Design), ARCH256 (Introduction to Photography), ARCH314 (Digital Design), ARCH328 (Approaches to Architecture and Urbanism), ARCH331 (Working with Wood), ARCH345 (Architectural Theory 1850-1990), ARCH347 (Philosophy in Architecture), ARCH443 (Architecture and Films)
- d) Inactivate ARCH277 (Timber: Design, Structure and Construction for Engineers)

Background & Rationale

1. The suite of elective offerings at the School of Architecture has not been updated for many years. Courses have been added, but not removed. This has resulted in a false representation of our elective offerings as presented to potential students.

The cohorts who started in 2019 and later only require 5 electives to complete their degree. 4 Architecture (one 510, one 570, two of 4XX/5XX and one open). The current positioning of these requirements in the calendar is as follows:

3B – Take one 510, one 570 and suggest one other 5XX

elective 4A – Take one Rome elective

4B – Take one open elective.

Unless a student takes an online course, they are unlikely to have taken an open elective. 3B ends up being an elective heavy term resulting in a large burden on the School of Architecture to offer sufficient courses/seats with all courses needing to be mounted in Cambridge. Electives are not “light” courses. Students are effectively discouraged from taking the 3 elective courses in Rome that we are already committed to offering and the necessarily support the discourse in studio and life of the term. We offer a great range of topics under the 5XX number in the spring term as graduate students need these, but technically they do not qualify as open electives and will need manual overrides for graduation if we agree to accept them a such and not force 4B student to take online courses instead. This is a lot of busy work for support staff and Associate Director Undergraduate.

Purposing to change elective offering to be framed as such, for a total of 5 electives. 4- 4XX or 5XX Architecture elective

2a) Inactivate experimental courses. This suite of courses under the “Experimental Course” title has been in the Architecture calendar from at least the 1980’s and was used in the past to permit the scheduling of a new course for offering while we waited for its ultimate approval and inclusion in the calendar. These have not been used since we joined Engineering in approx. 2005, and having them in the calendar is confusing and misleading for students.

2b) Inactivate architectural research courses. This suite of courses are titled “Reading Courses” and were used in the past to permit exceptional students to undertake independent research courses. After the shift from the terminal Bachelor Architecture degree to the Masters of Architecture degree, there was reduced ability for faculty to assist undergraduate students with independent study as well as a tendency for undergraduate students to fail to complete these courses in a timely fashion. It is felt that independent research at the School of Architecture is best

served by the masters thesis. We are maintaining ARCH 484 & ARCH 485 (Architectural Research) in operation to allow for this sort of research to continue for exceptional students who are further along in their education.

2c) Inactivate elective courses. These courses are electives that have not been offered in a number of years. We have shifted to a new method of listing courses under themed topic areas, meaning that the topics can still be offered, but in a new framework. Having these elective courses listed without any intention of offering them "as is" is very misleading to exchange students looking at our calendar, as well to outsiders looking at the calendar to understand our course offerings.

2d) Inactivate ARCH277 (Timber: Design, Structure and Construction for Engineers). With the launch of the Architectural Engineering program and the subsequent hire of numerous faculty in engineering who specialize in timber design, it was no longer necessary for the School of Architecture to offer this course to engineering students. Engineering now has their own course.

This would remain an anti-requisite in engineering calendar listing until such time as any CIVE students who took this version of the course are graduate and through the system.

Theme Areas

Courses in the Bachelor of Architectural Studies (BAS) degree are arranged in five main thematic groups:

1. Design: The practice of design and the understanding of its theories and methods.
2. Visual and Digital Media: The use of creative and analytical tools and techniques.
3. Cultural History and Theory: The understanding of cultural and historical forces shaping the built world.
4. Technology and Environment: The understanding of materials and methods, building technologies, and environmental issues and systems critical to the making of architecture.
5. Urbanism and Landscape: An introduction to urbanism and landscape and the organization of natural and human ecologies.

Professional Practice

Students gain invaluable architectural professional experience through the co-op program which integrates two years of alternating paid work terms into the pre-professional course of study. Through co-op, Architecture students expand their professional education and opportunities as they apply their knowledge and skills within architectural firms all over the world.

Academic Requirements and Program Sequence

Pre-Professional Architecture

Term IA (Fall)

- **ARCH 110** Visual and Digital Media 1 [0.50 unit] (Visual and Digital Media)
- **ARCH 120** An Introduction to Architectural Ideas and Communications [0.50 unit] (Cultural History and Theory)
- **ARCH 142** Introduction to Cultural History [0.50 unit] (Cultural History and Theory)
- **ARCH 172** Building Construction 1 [0.50 unit] (Technology and Environment)
- **ARCH 192** Design Studio [1.50 units] (Design)

Term 1B (Winter)

- **ARCH 113** Visual and Digital Media 2 [0.50 unit] (*Visual and Digital Media*)
- **ARCH 126** Environmental Building Design [0.50 unit] (*Technology and Environment*)
- **ARCH 143** Settlements, Sanctuaries, and Cities [1.00 unit] (*Cultural History and Theory*)
- **ARCH 173** Building Construction 2 [0.50 unit] (*Technology and Environment*)
- **ARCH 193** Design Studi[1.50 units] (*Design*) *Term 2A (Fall)*

Term 2A (Fall)

- **ARCH 212** Digital Fabrication [0.50 unit] (*Visual and Digital Media*)
- **ARCH 246** Cultural Encounters 600-1600 [1.00 unit] (*Cultural History and Theory*)
- **ARCH 260** Principles of Structures [0.50 unit] (*Technology and Environment*)
- **ARCH 292** Design Studio [1.50 units] (*Design*)

Term 2B (Spring)

- **ARCH 225** Theory and Design of the Contemporary Landscape [0.50 unit] (*Urbanism and Landscape*)
- **ARCH 243** Indigenous Practices [0.50 unit] (*Cultural History and Theory*)
- **ARCH 248** Cultural Encounters 1600-1914 [1.00 unit] (*Cultural History and Theory*)
- **ARCH 276** Timber: Design, Structure and Construction [0.50 unit] (*Technology and Environment*)
- **ARCH 293** Design Studio [1.50 units] (*Design*)

Term 3A (Winter)

- **ARCH 327** Architecture of the Urban Environment [0.50 unit] (*Urbanism and Landscape*)
- **ARCH 342** Modernisms: Local and Global [1.00 unit] (*Cultural History and Theory*)
- **ARCH 362** Steel and Concrete: Design, Structure and Construction [0.50 unit] (*Technology and Environment*)
- **ARCH 364** Building Science [0.50 unit] (*Technology and Environment*)
- **ARCH 392** Design Studio [1.50 units] (*Design*)

Term 3B (Fall)

- **ARCH 393** Option Design Studio [1.50 units] (*Design*)
- **ARCH 442** Contemporary Architectural Theory [0.50 unit] (*Cultural History and Theory*)
- Two ~~Technical~~ Architecture Electives **or Open Electives**
- ~~Open Elective~~

Term 4A (Fall, Rome)

- **ARCH 492** Design Studio [1.50 units] (*Design*)
- ~~Any Architecture Elective (Technical or General)~~ **Two Architecture Electives**

Note: The Rome 4A term is the only opportunity for students to take Rome elective offerings, and these courses (**ARCH 428**, **ARCH 446**, **ARCH 449**) are only offered on the Rome campus during the 4A term. Students can enrol in a second ARCH 400-level elective to fulfil the open elective requirement

Term 4B (Spring)

- **ARCH 463** Integrated Environmental Systems [0.50 unit] (*Technology and Environment*)
- **ARCH 473** Technical Report [0.50 unit] (*Technology and Environment*)
- **ARCH 493** Design Studio/ Comprehensive Building Design [1.50 units] (*Design*)
- Any Architecture Elective (~~Technical or General~~) **or Open Elective**

Electives

BAS program elective courses are organized into two primary groups: Architecture Electives (technical and general) and Open Electives.

Students must complete a minimum of five elective courses (0.5 unit each) as follows:

- Four Architecture Electives ~~where a minimum of two are Technical Architecture Electives~~
- One Open Elective **or Architecture Elective**

Architecture Electives

The Architecture elective requirement gives students breadth of study and opportunities for research at the upper levels of the pre-professional program in relation to four curricular areas. Architecture electives are organized into two groups: technical and general.

~~Group 1: Technical Architecture Electives~~

Students must complete a minimum of ~~two~~ **four** ~~Technical~~ Architecture Electives to meet graduation requirements.

- ARCH 510 Special Topics in Visual and Digital Media
- ~~ARCH 570 Special Topics in Building Technology and Environment~~
- ARCH 520 Special Topics in Urbanism and Landscape
- ARCH 540 Special Topics in Architectural History and Theory
- ARCH 570 Special Topics in Building Technology and Environment
- ARCH 580 Special Topics in Race, Equity, and Environmental Justice

~~Group 2: General Architecture Electives~~

- ARCH 428 Rome and the Campagna (Rome)
- ARCH 446 Italian Urban History (Rome)
- ARCH 449 The Development of Modern Italian Architecture (Rome)
- ~~ARCH 520 Special Topics in Urbanism and Landscape~~
- ~~ARCH 540 Special Topics in Architectural History and Theory~~

Open Elective

A minimum of one elective (0.50 unit) from any discipline, **any level**, including architecture, must be completed to satisfy the open elective requirement. This course is nominally placed in the ~~43~~B term, but it can be taken in any term in the second to fourth years (2B, 3A, 3B, 4A, 4B) of the BAS program.

Theme Areas

Courses in the Bachelor of Architectural Studies (BAS) degree are arranged in five main thematic groups:

1. Design: The practice of design and the understanding of its theories and methods.
2. Visual and Digital Media: The use of creative and analytical tools and techniques.
3. Cultural History and Theory: The understanding of cultural and historical forces shaping the built world.
4. Technology and Environment: The understanding of materials and methods, building technologies, and environmental issues and systems critical to the making of architecture.
5. Urbanism and Landscape: An introduction to urbanism and landscape and the organization of natural and human ecologies.

Professional Practice

Students gain invaluable architectural professional experience through the co-op program which integrates two years of alternating paid work terms into the pre-professional course of study. Through co-op, Architecture students expand their professional education and opportunities as they apply their knowledge and skills within architectural firms all over the world.

Academic Requirements and Program Sequence

Pre-Professional Architecture

Term 1A (Fall)

- ARCH 110 Visual and Digital Media 1 [0.50 unit] (Visual and Digital Media)
- ARCH 120 An Introduction to Architectural Ideas and Communications [0.50 unit] (Cultural History and Theory)
- ARCH 142 Introduction to Cultural History [0.50 unit] (Cultural History and Theory)
- ARCH 172 Building Construction 1 [0.50 unit] (Technology and Environment)
- ARCH 192 Design Studio [1.50 units] (Design)

Term 1B (Winter)

- ARCH 113 Visual and Digital Media 2 [0.50 unit] (*Visual and Digital Media*)
- ARCH 126 Environmental Building Design [0.50 unit] (*Technology and Environment*)
- ARCH 143 Settlements, Sanctuaries, and Cities [1.00 unit] (*Cultural History and Theory*)
- ARCH 173 Building Construction 2 [0.50 unit] (*Technology and Environment*)
- ARCH 193 Design Studio [1.50 units] (*Design*) Term 2A (Fall)

Term 2A (Fall)

- ARCH 212 Digital Fabrication [0.50 unit] (*Visual and Digital Media*)
- ARCH 246 Cultural Encounters 600-1600 [1.00 unit] (*Cultural History and Theory*)
- ARCH 260 Principles of Structures [0.50 unit] (*Technology and Environment*)
- ARCH 292 Design Studio [1.50 units] (*Design*)

Term 2B (Spring)

- ARCH 225 Theory and Design of the Contemporary Landscape [0.50 unit] (*Urbanism and Landscape*)
- ARCH 243 Indigenous Practices [0.50 unit] (*Cultural History and Theory*)
- ARCH 248 Cultural Encounters 1600-1914 [1.00 unit] (*Cultural History and Theory*)
- ARCH 276 Timber: Design, Structure and Construction [0.50 unit] (*Technology and Environment*)
- ARCH 293 Design Studio [1.50 units] (*Design*)

Term 3A (Winter)

- **ARCH 327** Architecture of the Urban Environment [0.50 unit] (*Urbanism and Landscape*)
- **ARCH 342** Modernisms: Local and Global [1.00 unit] (*Cultural History and Theory*)
- **ARCH 362** Steel and Concrete: Design, Structure and Construction [0.50 unit] (*Technology and Environment*)
- **ARCH 364** Building Science [0.50 unit] (*Technology and Environment*)
- **ARCH 392** Design Studio [1.50 units] (*Design*)

Term 3B (Fall)

- **ARCH 393** Option Design Studio [1.50 units] (*Design*)
- **ARCH 442** Contemporary Architectural Theory [0.50 unit] (*Cultural History and Theory*)
- Two Architecture Electives or Open Electives

Term 4A (Fall, Rome)

- **ARCH 492** Design Studio [1.50 units] (*Design*)
- Two Architecture Electives

Note: The Rome 4A term is the only opportunity for students to take Rome elective offerings, and these courses (**ARCH 428**, **ARCH 446**, **ARCH 449**) are only offered on the Rome campus during the 4A term. Students can enrol in a second ARCH 400-level elective to fulfil the open elective requirement

Term 4B (Spring)

- **ARCH 463** Integrated Environmental Systems [0.50 unit] (*Technology and Environment*)
- **ARCH 473** Technical Report [0.50 unit] (*Technology and Environment*)
- **ARCH 493** Design Studio/ Comprehensive Building Design [1.50 units] (*Design*)
- Any Architecture Elective or Open Elective

Electives

BAS program elective courses are organized into two primary groups: Architecture Electives and Open Electives.

Students must complete a minimum of five elective courses (0.5 unit each) as follows:

- Four Architecture Electives
- One Open Elective or Architecture Elective

Architecture Electives

The Architecture elective requirement gives students breadth of study and opportunities for research at the upper levels of the pre-professional program in relation to four curricular areas.

Students must complete a minimum of four Architecture Electives to meet graduation requirements.

- **ARCH 428** Rome and the Campagna (Rome)
- **ARCH 446** Italian Urban History (Rome)
- **ARCH 449** The Development of Modern Italian Architecture (Rome)
- **ARCH 510** Special Topics in Visual and Digital Media
- **ARCH 520** Special Topics in Urbanism and Landscape
- **ARCH 540** Special Topics in Architectural History and Theory
- **ARCH 570** Special Topics in Building Technology and Environment
- **ARCH 580** Special Topics in Race, Equity, and Environmental Justice

Open Elective

A minimum of one elective (0.50 unit) from any discipline, any level, including architecture, must be completed to satisfy the open elective requirement. This course is nominally placed in the 4B term, but it can be taken in any term in the second to fourth years (2B, 3A, 3B, 4A, 4B) of the BAS program

4.4 Chemical Engineering

Summary:

Minor Modification

Removing references to reflective reports and associated milestone.

Background & Rationale

WatPD courses now include mandatory reflection components and reflective reports are no longer required.

Requesting retroactive approval for 2023/2024 calendar. The Registrar's Office was consulted and agrees to this retro-active approval and that the change will be made to the 2023/24 Calendar as an amendment.

Chemical Engineering

MARK-UP COPY

Complementary Studies Electives

A total of five Complementary Studies Electives (CSEs), not including [MSCI 261](#), must be taken. The first of these courses must satisfy the Undergraduate Communication Requirement (see below). If some Complementary Studies Electives are satisfied online or from other institutions on a [Letter of Permission](#), when not in an academic term, each term's minimum course load must be maintained by substituting an approved "free" elective (technical or non-technical). For further details see [Complementary Studies Requirements for Engineering Students](#).

Undergraduate Communication Requirement

Strong communication skills are essential to academic, professional, and personal success. To achieve the [Undergraduate Communication Requirement](#), Chemical Engineering students must successfully complete a foundational course on communication. This course must be taken as the first Complementary Studies Elective course (CSE in the 1B term) and selected from the following list:

- [ENGL 109](#) Introduction to Academic Writing
- [ENGL 129R/EMLS 129R](#) Written Academic English
- [EMLS 101R](#) Oral Communications for Academic Purposes
- [EMLS 102R](#) Clear Communication in English Writing
- [SPCOM 100](#) Interpersonal Communication
- [SPCOM 223](#) Public Speaking

Failure to achieve the Undergraduate Communication Requirement before the end of the 2A term will result in a term decision of May Not Proceed (MNP). Communication skills are further developed and evaluated through work-term reports, as well as through design-focused ([CHE 180](#), [CHE 181](#), [CHE 383](#), [CHE 482](#), [CHE 483](#)) and investigation-focused courses ([CHE 390](#), [CHE 490](#), [CHE 491](#)).

Technical Work-term Reports ~~and Reflection Milestone~~

~~To achieve the Work-term Reflection Milestone, Chemical Engineering students must complete a minimum of four reflective work-term reports.~~

Two technical work-term reports are required. The first is completed as part of [PD 11](#) Processes for Technical Report Writing which must be selected as a PD elective, and the second through the [CHE 450](#) Technical Work-term Report course

Complementary Studies Electives

A total of five Complementary Studies Electives (CSEs), not including [MSCI 261](#), must be taken. The first of these courses must satisfy the Undergraduate Communication Requirement (see below). If some Complementary Studies Electives are satisfied online or from other institutions on a [Letter of Permission](#), when not in an academic term, each term's minimum course load must be maintained by substituting an approved "free" elective (technical or non-technical). For further details see [Complementary Studies Requirements for Engineering Students](#).

Undergraduate Communication Requirement

Strong communication skills are essential to academic, professional, and personal success. To achieve the [Undergraduate Communication Requirement](#), Chemical Engineering students must successfully complete a foundational course on communication. This course must be taken as the first Complementary Studies Elective course (CSE in the 1B term) and selected from the following list:

- [ENGL 109](#) Introduction to Academic Writing
- [ENGL 129R/EMLS 129R](#) Written Academic English
- [EMLS 101R](#) Oral Communications for Academic Purposes
- [EMLS 102R](#) Clear Communication in English Writing
- [SPCOM 100](#) Interpersonal Communication
- [SPCOM 223](#) Public Speaking

Failure to achieve the Undergraduate Communication Requirement before the end of the 2A term will result in a term decision of May Not Proceed (MNP). Communication skills are further developed and evaluated through work-term reports, as well as through design-focused ([CHE 180](#), [CHE 181](#), [CHE 383](#), [CHE 482](#), [CHE 483](#)) and investigation-focused courses ([CHE 390](#), [CHE 490](#), [CHE 491](#)).

Technical Work-term Reports

Two technical work-term reports are required. The first is completed as part of [PD 11](#) Processes for Technical Report Writing which must be selected as a PD elective, and the second through the [CHE 450](#) Technical Work-term Report course.

4.5 Geological Engineering

Summary:

Minor Modification:

Add CHE 514 (Fundamentals of Petroleum Production) to the Hydrogeology Specialization.

Background & Rationale

CHE 514 is a technical elective that is currently counted towards the Hydrogeology Specialization as an exception by the CEE UG Associate Chair and GEOE Director. Would like the course to formally be listed on the Hydrogeology Specialization list.

Geological Engineering

MARK UP

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Specializations

The Faculty of Engineering recognizes three specializations with the Geological Engineering BAsC degree. Students who satisfy the specialization requirements (courses and grades) will have the specialization designation shown on their transcript and diploma. Specializations are intended to recognize success in a concentration of electives within the Geological Engineering degree specification. In other words, specializations focus the selection of electives required for the base degree and do not require extra courses.

Each specialization requires students to select TEs with a common theme. Students are responsible for meeting the TE requirements of the Geological Engineering degree when pursuing a specialization. Each specialization requires the successful completion of a minimum number of TEs specified by the specialization with a minimum average of 60%. Students must declare a specialization for it to be recognized as part of their degree and appear on the transcript and diploma.

The specialization course requirements are provided below.

Geology Specialization

The Geology Specialization requires:

- [EARTH 221](#) Introductory Geochemistry
- [EARTH 471](#) Mineral Deposits

Minimum of two TEs from the list below

- [EARTH 331](#) Volcanology and Igneous Petrology
- [EARTH 332](#) Metamorphic Petrology
- [EARTH 342](#) Geomorphology and GIS Application
- [EARTH 421](#) Advanced Geochemistry
- [EARTH 435](#) Advanced Structural Geology

Hydrogeology Specialization

The Hydrogeology Specialization requires:

- [EARTH 221](#) Introductory Geochemistry

A minimum of three TEs from the list below

- [CHE 514 Fundamentals of Petroleum Production](#)
- [EARTH 342](#) Geomorphology and GIS Applications
- [EARTH 421](#) Advanced Geochemistry
- [EARTH 439](#) Flow and Transport Through Fractured Rocks
- [EARTH 440](#) Quaternary Geology
- [EARTH 444](#) Applied Wetland Science
- [EARTH 456](#) Numerical Methods in Hydrogeology
- [EARTH 459](#) Chemical Hydrogeology
- [EARTH 460](#) Geophysical Data Analysis
- [EARTH 461](#) Near-Surface Geophysics
- [ENVE 383](#) Advanced Hydrology and Hydraulics

Soil, Rock and Structures Specialization

The Soil, Rock and Structures Specialization requires:

- [CIVE 205](#) Solid Mechanics 2

A minimum of three TEs from the list below

- [CIVE 303](#) Structural Analysis
- [CIVE 306](#) Solid Mechanics 3
- [CIVE 310](#) Introduction to Structural Design
- [CIVE 422](#) Finite Element Analysis or [ME 559](#) Finite Element Methods
- [CIVE 542](#) Pavement Structural Design
- [EARTH 435](#) Advanced Structural Geology

Faculty Options

The Faculty of Engineering recognizes options within the BASc degree. Students who satisfy the option requirements (courses and grades) will have the option designation shown on their transcript and diploma. Options are intended to recognize success in a field of study outside of the basic degree. Consequently, students must usually take extra courses to complete an option.

Options recently completed by students in Geological Engineering are the Environmental Engineering Option, Management Sciences Option, and Physical Sciences Option. Complete details of designated options available to engineering students are provided in this Calendar in the section entitled [Options, Specializations and Electives for Engineering Students](#).

Accelerated Master's Program in Engineering

The Faculty of Engineering offers an Accelerated Master's Program. See [Accelerated Master's Programs](#) section for details.

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Specializations

The Faculty of Engineering recognizes three specializations with the Geological Engineering BAsC degree. Students who satisfy the specialization requirements (courses and grades) will have the specialization designation shown on their transcript and diploma. Specializations are intended to recognize success in a concentration of electives within the Geological Engineering degree specification. In other words, specializations focus the selection of electives required for the base degree and do not require extra courses.

Each specialization requires students to select TEs with a common theme. Students are responsible for meeting the TE requirements of the Geological Engineering degree when pursuing a specialization. Each specialization requires the successful completion of a minimum number of TEs specified by the specialization with a minimum average of 60%. Students must declare a specialization for it to be recognized as part of their degree and appear on the transcript and diploma.

The specialization course requirements are provided below.

Geology Specialization

The Geology Specialization requires:

- [EARTH 221](#) Introductory Geochemistry
- [EARTH 471](#) Mineral Deposits
- Minimum of two TEs from the list below
 - [EARTH 331](#) Volcanology and Igneous Petrology
 - [EARTH 332](#) Metamorphic Petrology
 - [EARTH 342](#) Geomorphology and GIS Application
 - [EARTH 421](#) Advanced Geochemistry
 - [EARTH 435](#) Advanced Structural Geology

Hydrogeology Specialization

The Hydrogeology Specialization requires:

- [EARTH 221](#) Introductory Geochemistry
- A minimum of three TEs from the list below
 - [CHE 514](#) Fundamentals of Petroleum Production
 - [EARTH 342](#) Geomorphology and GIS Applications
 - [EARTH 421](#) Advanced Geochemistry
 - [EARTH 439](#) Flow and Transport Through Fractured Rocks
 - [EARTH 440](#) Quaternary Geology
 - [EARTH 444](#) Applied Wetland Science
 - [EARTH 456](#) Numerical Methods in Hydrogeology
 - [EARTH 459](#) Chemical Hydrogeology
 - [EARTH 460](#) Geophysical Data Analysis
 - [EARTH 461](#) Near-Surface Geophysics

- [ENVE 383](#) Advanced Hydrology and Hydraulics

Soil, Rock and Structures Specialization

The Soil, Rock and Structures Specialization requires:

- [CIVE 205](#) Solid Mechanics 2
- A minimum of three TEs from the list below
 - [CIVE 303](#) Structural Analysis
 - [CIVE 306](#) Solid Mechanics 3
 - [CIVE 310](#) Introduction to Structural Design
 - [CIVE 422](#) Finite Element Analysis or [ME 559](#) Finite Element Methods
 - [CIVE 542](#) Pavement Structural Design
 - [EARTH 435](#) Advanced Structural Geology

Faculty Options

The Faculty of Engineering recognizes options within the BSc degree. Students who satisfy the option requirements (courses and grades) will have the option designation shown on their transcript and diploma. Options are intended to recognize success in a field of study outside of the basic degree. Consequently, students must usually take extra courses to complete an option.

Options recently completed by students in Geological Engineering are the Environmental Engineering Option, Management Sciences Option, and Physical Sciences Option. Complete details of designated options available to engineering students are provided in this Calendar in the section entitled [Options, Specializations and Electives for Engineering Students](#).

Accelerated Master's Program in Engineering

The Faculty of Engineering offers an Accelerated Master's Program. See [Accelerated Master's Programs](#) section for details.

4.6 Management Engineering

Summary:

1. Minor Modification

- a) Move MSCI 121 (Introduction to Computer Programming) to 1A from 1B
- b) Move PHYS 115 to 1B
- c) Drop PHYS 125 as a core course from 1B and move to NSE list
- d) Add NSE slot to 1B
- e) editorial changes to notes section

2. Course Changes

- a) Add new course (MSCI 232 - Modelling in Operations Research)
- b) Change title and description of MSCI 332
- c) Remove lab from MSCI 434
- d) Change related course prerequisites

Background & Rationale

1a) Moving MSCI 121 to 1A from 1B is in line with many other Engineering programs, which may mean better WEEF resources and transfer opportunities for students. In addition, provides students with skills in programming earlier on in the program and will help with coop recruitment.

1b) Moving PHYS 115 to 1B ensures students have required calculus preparation. Students' complete MATH 116 in 1A, and will be better prepared to complete PHYS115 in 1B.

1c) PHYS125 counts 100% towards natural science (NS) requirements. These requirements may be satisfied using other pre-approved NS electives. This allows students more flexibility to select a natural science field of interest.

1d) With the modification of PHYS 115 from 1B, this allows students the choice of selecting a natural science elective of their choosing while also maintaining term balance.

1e) Adding designation courses (MSCI 261, MSCI 263 & MSCI 211) for clarity as to which courses can be taken out of sequence to accommodate a reduced load and adding to the notes section of plan for clarity

2a) Creating a new course (MSCI 232 - Modelling in Operations Research) to be taken instead of MSCI 331 (Introduction to Optimization) in 2B. Optimization modelling and solution methods were covered at different levels in MSCI 331 and MSCI 332. One of the main learning outcomes (modelling) has not been met as planned. The revision aims to have a course focused on the model building process which is a fundamental skill for management engineering students. The lab in the new course will have hands-on experience with model building and mastery of professional optimization software.

2b) Revising MSCI 332 course title and description to better define topics taught in course and to align with MSCI232, which together will dedicate first to modelling and the second to solution methods.

2c) The lab in MSCI 434 is not used efficiently. The learning outcomes may be achieved without the lab component. A lab is a better fit in MSCI 232 where there is a significant design content.

2d) Changing prerequisites of affected MSCI courses to reflect the change of new MSCI232 course.

The Management Engineering Academic Curriculum

The term-by-term academic component of the curriculum is as follows:

Term 1A (Fall)

- [CHE 102](#) Chemistry for Engineers
- [MSCI 100](#) Management Engineering Concepts
- [MATH 115](#) Linear Algebra for Engineering
- [MATH 116](#) Calculus 1 for Engineering
- ~~[PHYS 115](#) Mechanics~~ **[MSCI 121](#) Introduction to Computer Programming**

Term 1B (Winter)

- [COMMST 192/ENGL 192](#) Communication in the Engineering Profession
- [GENE 123](#) Electrical Circuits and Instrumentation
- [MSCI 100B](#) Seminar
- ~~[MSCI 121](#) Introduction to Computer Programming~~ **[PHYS 115](#) Mechanics**
- [MSCI 131](#) Work Design and Facilities Planning
- [MATH 118](#) Calculus 2 for Engineering
- **[Natural Science Elective \(see Note 4\)](#)**
- ~~[PHYS 125](#) Physics for Engineers~~

Term 2A (Fall)

- [MSCI 200A](#) Seminar
- [MSCI 240](#) Algorithms and Data Structures
- [MSCI 251](#) Probability and Statistics 1
- [MSCI 261](#) Engineering Economics: Financial Management for Engineers **(D)**
- [MSCI 271](#) Advanced Calculus and Numerical Methods
- Natural Science Elective (see Note 4)

Term 2B (Spring)

- [MSCI 200B](#) Seminar
- **[MSCI 232](#) Modelling in Operations Research**
- [MSCI 245](#) Databases and Software Design
- [MSCI 253](#) Probability and Statistics 2
- [MSCI 263](#) Managerial Economics **(D)**
- ~~[MSCI 331](#) Introduction to Optimization~~
- Natural Science Elective (see Note 4)

Term 3A (Winter)

- [MSCI 211](#) Organizational Behaviour (**D**)
- [MSCI 300A](#) Seminar
- [MSCI 334](#) Operations Planning and Inventory Control
- [MSCI 342](#) Principles of Software Engineering
- [MSCI 391](#) Work-term Report
- [MSCI 431](#) Stochastic Models and Methods
- Elective

Term 3B (Fall)

- [MSCI 300B](#) Seminar
- [MSCI 302](#) Engineering Design Methods
- [MSCI 332](#) ~~Deterministic Optimization Models and Methods~~ **Fundamentals of Optimization**
- [MSCI 333](#) Simulation Analysis and Design
- [MSCI 343](#) Human-Computer Interaction
- [MSCI 392](#) Work-term Report
- Elective

Term 4A (Spring/[Fall](#))

- [MSCI 400A](#) Seminar
- [MSCI 401](#) Management Engineering Design Project 1
- [MSCI 434](#) Supply Chain Management
- [MSCI 436](#) Decision Support Systems
- [MSCI 491](#) Work-term Report
- Two electives

Term 4B (Winter)

- [MSCI 311](#) Organizational Design and Technology
- [MSCI 400B](#) Seminar
- [MSCI 402](#) Management Engineering Design Project 2
- Three electives

Notes

- [MSCI 401](#) and [MSCI 402](#) may be replaced by [GENE 403](#) and [GENE 404](#).
- Some of the elective courses have prerequisites that are not met by core courses in Management Engineering; see their course descriptions in the current Calendar before planning elective choices.
- Course offerings may vary from term to term; check course offerings before planning elective choices.
- If a student cannot find a natural science elective for this term, they may take another course towards their degree requirements with the permission of their academic advisor. Taking another course does not reduce the requirement of **two three** natural science electives.
- **To accommodate a reduced load MSCI 211, MSCI 261, and MSCI 263 may be taken out of sequence.**

Rules Restricting Choice of the ~~Nine~~ 10 Elective Courses

- Six of the ~~nine~~ 10 electives must be from the list of approved technical electives (see below). Students can count other Engineering courses towards this requirement subject to associate chair approval.
 - One of the ~~nine~~ 10 electives must be from List A of the [Complementary Studies Course Lists for Engineering](#) (i.e., a course on the impact of technology and/or engineering on society).
 - ~~Two~~ three of the ~~nine~~ 10 electives must be from the list of approved natural science electives (see below). Students can count other natural science courses towards this requirement subject to associate chair approval.

Technical Electives

Six courses from the following list:

- [MSCI 433](#) Applications of Management Engineering
- [MSCI 435](#) Advanced Optimization Techniques
- [MSCI 446](#) Introduction to Machine Learning
- [MSCI 452](#) Decision Making Under Uncertainty
- [MSCI 531](#) Stochastic Processes and Decision Making
- [MSCI 541](#) Search Engines
- [MSCI 543](#) Analytics and User Experience
- [MSCI 546](#) Advanced Machine Learning
- [MSCI 551](#) Quality Management and Control
- [MSCI 555](#) Scheduling: Theory and Practice
- [MSCI 598](#) Special Topics in Management Engineering

Natural Science Electives

~~Two~~ Three courses from the following list:

- [BIOL 110](#), [BIOL 130](#), [BIOL 150](#), [BIOL 165](#), [BIOL 211](#), [BIOL 220](#), [BIOL 239](#), [BIOL 240](#), [BIOL 273](#)
- [CHE 161](#)
- [CHEM 262](#)
- [EARTH 121](#), [EARTH 122](#), [EARTH 123](#), [EARTH 221](#)
- [ENVS 200](#)
- [PHYS 124](#), [PHYS 125](#), [PHYS 175](#), [PHYS 233](#), [PHYS 275](#)
- [PSYCH 207](#), [PSYCH 261](#)
- [SCI 238](#), [SCI 250](#)

Professional Development Courses

Professional development (PD) courses are required as described in the BAsC and BSE Specific Degree Requirements section on [Work Terms](#). Management Engineering students are also required to take [PD 11](#) Processes for Technical Report Writing and [PD 22](#) Professionalism and Ethics in Engineering Practice. These courses replace two of the PD electives such that for Management Engineering students, [PD 11](#) and [PD 22](#) are additional core PD courses, and the number of PD electives required is reduced by two. Management Engineering students are automatically enrolled in the required core PD courses, [PD 11](#) and [PD 22](#), but must enrol in the elective.

The Management Engineering Academic Curriculum

The term-by-term academic component of the curriculum is as follows:

Term 1A (Fall)

- [CHE 102](#) Chemistry for Engineers
- [MSCI 100](#) Management Engineering Concepts
- [MATH 115](#) Linear Algebra for Engineering
- [MATH 116](#) Calculus 1 for Engineering
- [MSCI 121](#) Introduction to Computer Programming

Term 1B (Winter)

- [COMMST 192/ENGL 192](#) Communication in the Engineering Profession
- [GENE 123](#) Electrical Circuits and Instrumentation
- [MSCI 100B](#) Seminar
- [MSCI 131](#) Work Design and Facilities Planning
- [MATH 118](#) Calculus 2 for Engineering
- [PHYS 115](#) Mechanics
- Natural Science Elective (see Note 4)

Term 2A (Fall)

- [MSCI 200A](#) Seminar
- [MSCI 240](#) Algorithms and Data Structures
- [MSCI 251](#) Probability and Statistics 1
- [MSCI 261](#) Engineering Economics: Financial Management for Engineers (D)
- [MSCI 271](#) Advanced Calculus and Numerical Methods
- Natural Science Elective (see Note 4)

Term 2B (Spring)

- [MSCI 200B](#) Seminar
- [MSCI 232](#) Modelling in Operations Research
- [MSCI 245](#) Databases and Software Design
- [MSCI 253](#) Probability and Statistics 2
- [MSCI 263](#) Managerial Economics (D)
- Natural Science Elective (see Note 4)

Term 3A (Winter)

- [MSCI 211](#) Organizational Behaviour (D)
- [MSCI 300A](#) Seminar
- [MSCI 334](#) Operations Planning and Inventory Control
- [MSCI 342](#) Principles of Software Engineering
- [MSCI 391](#) Work-term Report
- [MSCI 431](#) Stochastic Models and Methods
- Elective

Term 3B (Fall)

- [MSCI 300B](#) Seminar
- [MSCI 302](#) Engineering Design Methods
- [MSCI 332](#) Fundamentals of Optimization
- [MSCI 333](#) Simulation Analysis and Design
- [MSCI 343](#) Human-Computer Interaction
- [MSCI 392](#) Work-term Report
- Elective

Term 4A (Spring/Fall)

- [MSCI 400A](#) Seminar
- [MSCI 401](#) Management Engineering Design Project 1
- [MSCI 434](#) Supply Chain Management
- [MSCI 436](#) Decision Support Systems
- [MSCI 491](#) Work-term Report
- Two electives

Term 4B (Winter)

- [MSCI 311](#) Organizational Design and Technology
- [MSCI 400B](#) Seminar
- [MSCI 402](#) Management Engineering Design Project 2
- Three electives

Notes

- [MSCI 401](#) and [MSCI 402](#) may be replaced by [GENE 403](#) and [GENE 404](#).
- Some of the elective courses have prerequisites that are not met by core courses in Management Engineering; see their course descriptions in the current Calendar before planning elective choices.
- Course offerings may vary from term to term; check course offerings before planning elective choices.
- If a student cannot find a natural science elective for this term, they may take another course towards their degree requirements with the permission of their academic advisor. Taking another course does not reduce the requirement of three natural science electives.
- To accommodate a reduced load [MSCI 211](#), [MSCI 261](#) and [MSCI 263](#) may be taken out of sequence.

Rules Restricting Choice of the 10 Elective Courses

- Six of the 10 electives must be from the list of approved technical electives (see below). Students can count other Engineering courses towards this requirement subject to associate chair approval.
- One of the 10 electives must be from List A of the [Complementary Studies Course Lists for Engineering](#) (i.e., a course on the impact of technology and/or engineering on society).
- Three of the ten electives must be from the list of approved natural science electives (see below). Students can count other natural science courses towards this requirement subject to associate chair approval.

Technical Electives

Six courses from the following list:

- [MSCI 433](#) Applications of Management Engineering
- [MSCI 435](#) Advanced Optimization Techniques
- [MSCI 446](#) Introduction to Machine Learning
- [MSCI 452](#) Decision Making Under Uncertainty
- [MSCI 531](#) Stochastic Processes and Decision Making
- [MSCI 541](#) Search Engines
- [MSCI 543](#) Analytics and User Experience
- [MSCI 546](#) Advanced Machine Learning
- [MSCI 551](#) Quality Management and Control
- [MSCI 555](#) Scheduling: Theory and Practice
- [MSCI 598](#) Special Topics in Management Engineering

Natural Science Electives

Three courses from the following list:

- [BIOL 110](#), [BIOL 130](#), [BIOL 150](#), [BIOL 165](#), [BIOL 211](#), [BIOL 220](#), [BIOL 239](#), [BIOL 240](#), [BIOL 273](#)
- [CHE 161](#)
- [CHEM 262](#)
- [EARTH 121](#), [EARTH 122](#), [EARTH 123](#), [EARTH 221](#)
- [ENVS 200](#)
- [PHYS 124](#), [PHYS 125](#), [PHYS 175](#), [PHYS 233](#), [PHYS 275](#)
- [PSYCH 207](#), [PSYCH 261](#)
- [SCI 238](#), [SCI 250](#)

Professional Development Courses

Professional development (PD) courses are required as described in the BAsC and BSE Specific Degree Requirements section on [Work Terms](#). Management Engineering students are also required to take [PD 11](#) Processes for Technical Report Writing and [PD 22](#) Professionalism and Ethics in Engineering Practice. These courses replace two of the PD electives such that for Management Engineering students, [PD 11](#) and [PD 22](#) are additional core PD courses, and the number of PD electives required is reduced by two. Management Engineering students are automatically enrolled in the required core PD courses, [PD 11](#) and [PD 22](#), but must enrol in the elective.

4.7 Computing Option

Summary:

Minor Modification:

- a) Add courses to related lists.
- b) Editorial text

Background & Rationale

Adding CS 137 (Programming Principles), CS 138 (Introduction to Data Abstraction and Implementation), MTE 544 (Autonomous Mobile Robotics), and MTE 546 (Multi-Sensor Data Fusion). The Computing, Computer Engineering (CE) and Software Engineering (SE) Options are specifically designed together to make it easy for students to switch between them. A common pathway will be that students pick the SE Option in second year, then want to switch to CE Option or Students who try to earn an Artificial Intelligence option, but fell short by one or two courses can fall back on the Computing option with these additions. If the lists are identical, then every course that they've taken for one option will still count towards the other two options.

Computing Option

MARK UP

The Computing Option is available to all students in the Faculty of Engineering (including Architecture), except students in Computer Engineering or Software Engineering. It requires six courses:

- At least one introductory programming course
- At least one data structures and algorithms course
- At least two topics courses
- Two additional courses selected from any list below

The courses chosen to satisfy this Option must satisfy ~~four~~ **two** additional constraints:

- ~~• They must satisfy Canadian Engineering Accreditation Board (CEAB) requirements.~~
- ~~• They must be approved by the option co-ordinator.~~
- Three of the courses must be considered elective (that is, not core requirements) in the student's academic plan. For the purposes of this Option, a course that a student could choose to graduate without will be considered elective.
- The student must have earned a minimum average of 75% in the selected courses in order to have earned the Option.

Students may not declare this Option until they have completed both an introductory programming course and a data structures and algorithms course. Students must have a minimum average of 75% in these two courses in order to declare this Option.

The lists below are intended to be the same as the **Computer Engineering Option** and **Software Engineering Option**. These lists are also intended to include courses that are normally part of the **Computing Minor** offered by the Cheriton School of Computer Science. Other courses from Computer Science may be used towards this Option with permission of the option co-ordinator. Students may declare at most one of the Computing Option, Computer Engineering Option, or Software Engineering Option. Students may change which of the three Options they declare by contacting the **option co-ordinator(s)**.

Introductory Programming

- **AE 121** Computational Methods
- **BME 121** Digital Computation

- **CHE 120** Computer Literacy and Programming for Chemical Engineers
- **CIVE 121/ENVE 121/GEOE 121** Computational Methods
- **CS 115** Introduction to Computer Science 1
- **CS 116** Introduction to Computer Science 2
- **CS 135** Designing Functional Programs
- **CS 137 Programming Principles**
- **CS 145** Designing Functional Programs (Advanced Level)
- **ECE 150** Fundamentals of Programming
- **ME 101** Introduction to Mechanical Engineering Practice 2
- **MSCI 121** Introduction to Computer Programming
- **MTE 121** Digital Computation
- **NE 111** Introduction to Programming for Engineers
- **SYDE 121** Digital Computation

Data Structures and Algorithms

- **BME 122** Data Structures and Algorithms
- **CS 136** Elementary Algorithm Design and Data Abstraction and **CS 136L** Tools and Techniques for Software Development (see Note)
- **CS 138 Introduction Data Abstraction and Implementation**
- **CS 146** Elementary Algorithm Design and Data Abstraction (Advanced Level) and **CS 136L** Tools and Techniques for Software Development (see Note)
- **CS 231** Algorithmic Problem Solving
- **CS 234** Data Types and Structures
- **ECE 250** Algorithms and Data Structures
- **ECE 406** Algorithm Design and Analysis
- **MSCI 240** Algorithms and Data Structures
- **MTE 140** Algorithms and Data Structures
- **SYDE 223** Data Structures and Algorithms

Note: Students who take **CS 136** or **CS 146** will also be required to enrol in **CS 136L** which is graded on a CR/NCR basis. However, passing **CS 136L** is not a requirement for the option and the course may be coded as **NRNA**.

Topics List

The following list of topics are organized into specific areas for readability.

Logic

- **CS 245** Logic and Computation
- **ECE 208** Discrete Mathematics and Logic 2
- **SE 212** Logic and Computation

Databases

- **CS 338** Computer Applications in Business: Databases
- **ECE 356** Database Systems
- **MSCI 245** Databases and Software Design

Operating Systems

- **ECE 350** Real-Time Operating Systems
- **MTE 241** Introduction to Computer Structures and Real-Time Systems
- **SE 350** Operating Systems

Computing Systems

- ECE 252 Systems Programming and Concurrency
- ECE 351 Compilers
- ECE 454 Distributed Computing
- ECE 455 Embedded Software
- ECE 459 Programming for Performance

Networks

- ECE 358 Computer Networks

Digital Hardware

- BME 393 Digital Systems
- CS 230 Introduction to Computers and Computer Systems
- ECE 124 Digital Circuits and Systems
- ECE 222 Digital Computers
- ECE 224 Embedded Microprocessor Systems
- ECE 320 Computer Architecture
- ECE 327 Digital Hardware Systems
- ECE 423 Embedded Computer Systems
- ME 262 Introduction to Microprocessors and Digital Logic
- MTE 262 Introduction to Microprocessors and Digital Logic
- MTE 325 Microprocessor Systems and Interfacing for Mechatronics Engineering
- SYDE 192 Digital Systems

Software Engineering

- CS 445/ECE 451 Software Requirements Specification and Analysis
- CS 446/ECE 452 Software Design and Architectures
- CS 447/ECE 453 Software Testing, Quality Assurance and Maintenance
- MSCI 342 Principles of Software Engineering
- SE 463 Software Requirements Specification and Analysis
- SE 464 Software Design and Architectures
- SE 465 Software Testing and Quality Assurance

Human-Computer Interaction

- MSCI 343 Human-Computer Interaction
- MSCI 541 Search Engines
- MSCI 543 Analytics and User Experience
- SYDE 542 Interface Design
- SYDE 543 Cognitive Ergonomics
- SYDE 548 User Centred Design Methods

Security and Privacy

- ECE 409 Cryptography and System Security
- ECE 458 Computer Security

Pattern Analysis and Machine Intelligence

- ECE 417 Image Processing
- ECE 457A Co-operative and Adaptive Algorithms
- ECE 457B Fundamentals of Computational Intelligence
- ECE 457C Reinforcement Learning
- MSCI 436 Decision Support Systems
- MSCI 446 Introduction to Machine Learning

- **MSCI 546** Advanced Machine Learning
- **MTE 544 Autonomous Mobile Robotics**
- **MTE 546 Multi-Sensor Data Fusion**
- **SYDE 522** Foundations of Artificial Intelligence
- **SYDE 552/BIOL 487** Computational Neuroscience
- **SYDE 556** Simulating Neurobiological Systems
- **SYDE 572** Introduction to Pattern Recognition
- **SYDE 575** Image Processing

Numerical Methods

- **BME 411** Optimization and Numerical Methods
- **CHE 322** Numerical Methods for Process Analysis and Design
- **CIVE 422** Finite Element Analysis
- **EARTH 456** Numerical Methods in Hydrogeology
- **ECE 204** Numerical Methods
- **ECE 204A** Numerical Methods 1 and **ECE 204B** Numerical Methods 2
- **ENVE 225** Environmental Modelling
- **ME 559** Finite Element Methods
- **ME 566** Computational Fluid Dynamics for Engineering Design
- **MTE 204** Numerical Methods
- **NE 336** Micro and Nanosystem Computer-aided Design
- **SYDE 411** Optimization and Numerical Methods

Special topics courses as approved by the **option co-ordinator**.

Computing Option

CLEAN COPY

The Computing Option is available to all students in the Faculty of Engineering (including Architecture), except students in Computer Engineering or Software Engineering. It requires six courses:

- At least one introductory programming course
- At least one data structures and algorithms course
- At least two topics courses
- Two additional courses selected from any list below

The courses chosen to satisfy this Option must satisfy two additional constraints:

- Three of the courses must be considered elective (that is, not core requirements) in the student's academic plan. For the purposes of this Option, a course that a student could choose to graduate without will be considered elective.
- The student must have earned a minimum average of 75% in the selected courses in order to have earned the Option.

Students may not declare this Option until they have completed both an introductory programming course and a data structures and algorithms course. Students must have a minimum average of 75% in these two courses in order to declare this Option.

The lists below are intended to be the same as the **Computer Engineering Option** and **Software Engineering Option**. These lists are also intended to include courses that are normally part of the **Computing Minor** offered by the Cheriton School of Computer Science. Other courses from Computer Science may be used towards this Option with permission of the option co-ordinator. Students may declare at most one of the Computing Option, Computer Engineering Option, or Software Engineering Option. Students may change

which of the three Options they declare by contacting the **option co-ordinator(s)**.

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- **CS 137** Programming Principles
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- **SYDE 121** Digital Computation

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- **BME 122** Data Structures and Algorithms
- **CS 136** Elementary Algorithm Design and Data Abstraction and **CS 136L** Tools and Techniques for Software Development (see Note)
- **CS 138** Introduction Data Abstraction and Implementation
- **CS 146** Elementary Algorithm Design and Data Abstraction (Advanced Level) and **CS 136L** Tools and Techniques for Software Development (see Note)
- **CS 231** Algorithmic Problem Solving
- **CS 234** Data Types and Structures
- **ECE 250** Algorithms and Data Structures
- **ECE 406** Algorithm Design and Analysis
- **MSCI 240** Algorithms and Data Structures
- **MTE 140** Algorithms and Data Structures
- **SYDE 223** Data Structures and Algorithms

Note: Students who take **CS 136** or **CS 146** will also be required to enrol in **CS 136L** which is graded on a CR/NCR basis. However, passing **CS 136L** is not a requirement for the option and the course may be coded as **NRNA**.

Topics List

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- **ECE 356** Database Systems
- **MSCI 245** Databases and Software Design

Operating Systems

- ECE 350 Real-Time Operating Systems
- MTE 241 Introduction to Computer Structures and Real-Time Systems
- SE 350 Operating Systems

Computing Systems

- ECE 252 Systems Programming and Concurrency
- ECE 351 Compilers
- ECE 454 Distributed Computing
- ECE 455 Embedded Software
- ECE 459 Programming for Performance

Networks

- ECE 358 Computer Networks

Digital Hardware

- BME 393 Digital Systems
- CS 230 Introduction to Computers and Computer Systems
- ECE 124 Digital Circuits and Systems
- ECE 222 Digital Computers
- ECE 224 Embedded Microprocessor Systems
- ECE 320 Computer Architecture
- ECE 327 Digital Hardware Systems
- ECE 423 Embedded Computer Systems
- ME 262 Introduction to Microprocessors and Digital Logic
- MTE 262 Introduction to Microprocessors and Digital Logic
- MTE 325 Microprocessor Systems and Interfacing for Mechatronics Engineering
- SYDE 192 Digital Systems

Software Engineering

- CS 445/ECE 451 Software Requirements Specification and Analysis
- CS 446/ECE 452 Software Design and Architectures
- CS 447/ECE 453 Software Testing, Quality Assurance and Maintenance
- MSCI 342 Principles of Software Engineering
- SE 463 Software Requirements Specification and Analysis
- SE 464 Software Design and Architectures
- SE 465 Software Testing and Quality Assurance

Human-Computer Interaction

- MSCI 343 Human-Computer Interaction
- MSCI 541 Search Engines
- MSCI 543 Analytics and User Experience
- SYDE 542 Interface Design
- SYDE 543 Cognitive Ergonomics
- SYDE 548 User Centred Design Methods

Security and Privacy

- ECE 409 Cryptography and System Security
- ECE 458 Computer Security

Pattern Analysis and Machine Intelligence

- ECE 417 Image Processing
- ECE 457A Co-operative and Adaptive Algorithms
- ECE 457B Fundamentals of Computational Intelligence
- ECE 457C Reinforcement Learning
- MSCI 436 Decision Support Systems
- MSCI 446 Introduction to Machine Learning
- MSCI 546 Advanced Machine Learning
- MTE 544 Autonomous Mobile Robotics
- MTE 546 Multi-Sensor Data Fusion
- SYDE 522 Foundations of Artificial Intelligence
- SYDE 552/BIOL 487 Computational Neuroscience
- SYDE 556 Simulating Neurobiological Systems
- SYDE 572 Introduction to Pattern Recognition
- SYDE 575 Image Processing

Numerical Methods

- BME 411 Optimization and Numerical Methods
- CHE 322 Numerical Methods for Process Analysis and Design
- CIVE 422 Finite Element Analysis
- EARTH 456 Numerical Methods in Hydrogeology
- ECE 204 Numerical Methods
- ECE 204A Numerical Methods 1 and ECE 204B Numerical Methods 2
- ENVE 225 Environmental Modelling
- ME 559 Finite Element Methods
- ME 566 Computational Fluid Dynamics for Engineering Design
- MTE 204 Numerical Methods
- NE 336 Micro and Nanosystem Computer-aided Design
- SYDE 411 Optimization and Numerical Methods

Special topics courses as approved by the **option co-ordinator**.

4.8 Computer Engineering Option

Summary:

Minor Modification:

- a) Add courses to related lists.
- b) Editorial text

Background and Rationale:

Adding CS 137 (Programming Principles), CS 138 (Introduction to Data Abstraction and Implementation), MTE 544 (Autonomous Mobile Robotics), and MTE 546 (Multi-Sensor Data Fusion). The Computing, Computer Engineering (CE) and Software Engineering (SE) Options are specifically designed together to make it easy for students to switch between them. A common pathway will be that students pick the SE Option in second year, then want to switch to CE Option or Students who try to earn an Artificial Intelligence option, but fell short by one or two courses can fall back on the Computing option with these additions. If the lists are identical, then every course that they've taken for one option will still count towards the other two options

Computer Engineering Option

MARK UP

The Computer Engineering Option is available to all students in the Faculty of Engineering (including Architecture), except students in Computer Engineering. It requires a total of eight courses:

- Two of:
 - ECE 320 Computer Architecture
 - ECE 327 Digital Hardware Systems
 - ECE 423 Embedded Computer Systems
 - ECE 455 Embedded Software
- Five additional courses from the topics list below, one of which may be substituted with a course from the data structures and algorithms list.
- One course from List A **Complementary Studies Course Lists for Engineering Students** that considers application of computing technology, or an alternative approved by the option co-ordinator.

The courses chosen to satisfy this Option must satisfy ~~four~~ **two** additional constraints:

- ~~• They must satisfy Canadian Engineering Accreditation Board (CEAB) requirements.~~
- ~~• They must be approved by the option co-ordinator.~~
- Five of the courses must be considered elective (that is, not core requirements) in the student's academic plan. For the purposes of this Option, a course that a student could choose to graduate without will be considered elective.
- The student must have earned a minimum average of 75% in the selected courses in order to have earned the Option.

Students pursuing this Option are recommended to select courses in the areas of logic, digital hardware, operating systems, computing systems, databases, networks, and security and privacy.

Students may not declare this Option until they have completed both an introductory programming course and a data structures and algorithms course. Students must have a minimum average of 75% in these two courses in order to declare this Option.

The lists below are intended to be the same as for the **Computing Option** and the **Software Engineering Option**. These lists are also intended to include courses that are normally part of the **Computing Minor** offered by the Cheriton School of Computer Science. Other courses from Computer Science may be used towards this Option with permission of the option co-ordinator. Students may declare at most one of the Computing Option, Computer Engineering

Option, or Software Engineering Option. Students may change which of the three Options they declare by contacting the [option co-ordinator\(s\)](#).

Introductory Programming

- [AE 121](#) Computational Methods
- [BME 121](#) Digital Computation
- [CHE 120](#) Computer Literacy and Programming for Chemical Engineers
- [CIVE 121/ENVE 121/GEOE 121](#) Computational Methods
- [CS 115](#) Introduction to Computer Science 1
- [CS 116](#) Introduction to Computer Science 2
- [CS 135](#) Designing Functional Programs
- [CS 137 Programming Principles](#)
- [CS 145](#) Designing Functional Programs (Advanced Level)
- [ECE 150](#) Fundamentals of Programming
- [ME 101](#) Introduction to Mechanical Engineering Practice 2
- [MSCI 121](#) Introduction to Computer Programming
- [MTE 121](#) Digital Computation
- [NE 111](#) Introduction to Programming for Engineers
- [SYDE 121](#) Digital Computation

Data Structures and Algorithms

- [BME 122](#) Data Structures and Algorithms
- [CS 136](#) Elementary Algorithm Design and Data Abstraction and [CS 136L](#) Tools and Techniques for Software Development (see Note)
- [CS 138 Introduction to Data Abstraction and Implementation](#)
- [CS 146](#) Elementary Algorithm Design and Data Abstraction (Advanced Level) and [CS 136L](#) Tools and Techniques for Software Development (see Note)
- [CS 231](#) Algorithmic Problem Solving
- [CS 234](#) Data Types and Structures
- [ECE 250](#) Algorithms and Data Structures
- [ECE 406](#) Algorithm Design and Analysis
- [MSCI 240](#) Algorithms and Data Structures
- [MTE 140](#) Algorithms and Data Structures
- [SYDE 223](#) Data Structures and Algorithms

Note: Students who take [CS 136](#) or [CS 146](#) will also be required to enrol in [CS 136L](#) which is graded on a CR/NCR basis. However, passing [CS 136L](#) is not a requirement for the option and the course may be coded as [NRNA](#).

Topics List

The following list of topics are organized into specific areas for readability.

Logic

- [CS 245](#) Logic and Computation
- [ECE 208](#) Discrete Mathematics and Logic 2
- [SE 212](#) Logic and Computation

Databases

- [CS 338](#) Computer Applications in Business: Databases
- [ECE 356](#) Database Systems
- [MSCI 245](#) Databases and Software Design

Operating Systems

- ECE 350 Real-Time Operating Systems
- MTE 241 Introduction to Computer Structures and Real-Time Systems
- SE 350 Operating Systems

Computing Systems

- ECE 252 Systems Programming and Concurrency
- ECE 351 Compilers
- ECE 454 Distributed Computing
- ECE 455 Embedded Software
- ECE 459 Programming for Performance

Networks

- ECE 358 Computer Networks

Digital Hardware

- BME 393 Digital Systems
- CS 230 Introduction to Computers and Computer Systems
- ECE 124 Digital Circuits and Systems
- ECE 222 Digital Computers
- ECE 224 Embedded Microprocessor Systems
- ECE 320 Computer Architecture
- ECE 327 Digital Hardware Systems
- ECE 423 Embedded Computer Systems
- ME 262 Introduction to Microprocessors and Digital Logic
- MTE 262 Introduction to Microprocessors and Digital Logic
- MTE 325 Microprocessor Systems and Interfacing for Mechatronics Engineering
- SYDE 192 Digital Systems

Software Engineering

- CS 445/ECE 451 Software Requirements Specification and Analysis
- CS 446/ECE 452 Software Design and Architectures
- CS 447/ECE 453 Software Testing, Quality Assurance and Maintenance
- MSCI 342 Principles of Software Engineering
- SE 463 Software Requirements Specification and Analysis
- SE 464 Software Design and Architectures
- SE 465 Software Testing and Quality Assurance

Human-Computer Interaction

- MSCI 343 Human-Computer Interaction
- MSCI 541 Search Engines
- MSCI 543 Analytics and User Experience
- SYDE 542 Interface Design
- SYDE 543 Cognitive Ergonomics
- SYDE 548 User Centred Design Methods

Security and Privacy

- ECE 409 Cryptography and System Security
- ECE 458 Computer Security

Pattern Analysis and Machine Intelligence

- ECE 417 Image Processing
- ECE 457A Co-operative and Adaptive Algorithms
- ECE 457B Fundamentals of Computational Intelligence
- ECE 457C Reinforcement Learning
- MSCI 436 Decision Support Systems
- MSCI 446 Introduction to Machine Learning
- MSCI 546 Advanced Machine Learning
- **MTE 544 Autonomous Mobile Robotics**
- **MTE 546 Multi-Sensor Data Fusion**
- SYDE 522 Foundations of Artificial Intelligence
- SYDE 552/BIOL 487 Computational Neuroscience
- SYDE 556 Simulating Neurobiological Systems
- SYDE 572 Introduction to Pattern Recognition
- SYDE 575 Image Processing

Numerical Methods

- BME 411 Optimization and Numerical Methods
- CHE 322 Numerical Methods for Process Analysis and Design
- CIVE 422 Finite Element Analysis
- EARTH 456 Numerical Methods in Hydrogeology
- ECE 204 Numerical Methods
- ECE 204A Numerical Methods 1 and ECE 204B Numerical Methods 2
- ENVE 225 Environmental Modelling
- ME 559 Finite Element Methods
- ME 566 Computational Fluid Dynamics for Engineering Design
- MTE 204 Numerical Methods
- NE 336 Micro and Nanosystem Computer-aided Design
- SYDE 411 Optimization and Numerical Methods

Special topics courses as approved by the **option co-ordinator**.

Computer Engineering Option

CLEAN COPY

The Computer Engineering Option is available to all students in the Faculty of Engineering (including Architecture), except students in Computer Engineering. It requires a total of eight courses:

- Two of:
 - ECE 320 Computer Architecture
 - ECE 327 Digital Hardware Systems
 - ECE 423 Embedded Computer Systems
 - ECE 455 Embedded Software
- Five additional courses from the topics list below, one of which may be substituted with a course from the data structures and algorithms list.
- One course from List A **Complementary Studies Course Lists for Engineering Students** that considers application of computing technology, or an alternative approved by the option co-ordinator.

The courses chosen to satisfy this Option must satisfy two additional constraints:

- Five of the courses must be considered elective (that is, not core requirements) in the student's academic plan. For the purposes of this Option, a course that a student could choose to graduate without will be considered elective.
- The student must have earned a minimum average of 75% in the selected courses in

order to have earned the Option.

Students pursuing this Option are recommended to select courses in the areas of logic, digital hardware, operating systems, computing systems, databases, networks, and security and privacy.

Students may not declare this Option until they have completed both an introductory programming course and a data structures and algorithms course. Students must have a minimum average of 75% in these two courses in order to declare this Option.

The lists below are intended to be the same as for the **Computing Option** and the **Software Engineering Option**. These lists are also intended to include courses that are normally part of the **Computing Minor** offered by the Cheriton School of Computer Science. Other courses from Computer Science may be used towards this Option with permission of the option co-ordinator. Students may declare at most one of the Computing Option, Computer Engineering Option, or Software Engineering Option. Students may change which of the three Options they declare by contacting the **option co-ordinator(s)**.

Introductory Programming

- **AE 121** Computational Methods
- **BME 121** Digital Computation
- **CHE 120** Computer Literacy and Programming for Chemical Engineers
- **CIVE 121/ENVE 121/GEOE 121** Computational Methods
- **CS 115** Introduction to Computer Science 1
- **CS 116** Introduction to Computer Science 2
- **CS 135** Designing Functional Programs
- **CS 137** Programming Principles
- **CS 145** Designing Functional Programs (Advanced Level)
- **ECE 150** Fundamentals of Programming
- **ME 101** Introduction to Mechanical Engineering Practice 2
- **MSCI 121** Introduction to Computer Programming
- **MTE 121** Digital Computation
- **NE 111** Introduction to Programming for Engineers
- **SYDE 121** Digital Computation

Data Structures and Algorithms

- **BME 122** Data Structures and Algorithms
- **CS 136** Elementary Algorithm Design and Data Abstraction and **CS 136L** Tools and Techniques for Software Development (see Note)
- **CS 138** Introduction to Data Abstraction and Implementation
- **CS 146** Elementary Algorithm Design and Data Abstraction (Advanced Level) and **CS 136L** Tools and Techniques for Software Development (see Note)
- **CS 231** Algorithmic Problem Solving
- **CS 234** Data Types and Structures
- **ECE 250** Algorithms and Data Structures
- **ECE 406** Algorithm Design and Analysis
- **MSCI 240** Algorithms and Data Structures
- **MTE 140** Algorithms and Data Structures
- **SYDE 223** Data Structures and Algorithms

Note: Students who take **CS 136** or **CS 146** will also be required to enrol in **CS 136L** which is graded on a CR/NCR basis. However, passing **CS 136L** is not a requirement for the option and the course may be coded as **NRNA**.

Topics List

The following list of topics are organized into specific areas for readability.

Logic

- **CS 245** Logic and Computation
- **ECE 208** Discrete Mathematics and Logic 2
- **SE 212** Logic and Computation

Databases

- **CS 338** Computer Applications in Business: Databases
- **ECE 356** Database Systems
- **MSCI 245** Databases and Software Design

Operating Systems

- **ECE 350** Real-Time Operating Systems
- **MTE 241** Introduction to Computer Structures and Real-Time Systems
- **SE 350** Operating Systems

Computing Systems

- **ECE 252** Systems Programming and Concurrency
- **ECE 351** Compilers
- **ECE 454** Distributed Computing
- **ECE 455** Embedded Software
- **ECE 459** Programming for Performance

Networks

- **ECE 358** Computer Networks

Digital Hardware

- **BME 393** Digital Systems
- **CS 230** Introduction to Computers and Computer Systems
- **ECE 124** Digital Circuits and Systems
- **ECE 222** Digital Computers
- **ECE 224** Embedded Microprocessor Systems
- **ECE 320** Computer Architecture
- **ECE 327** Digital Hardware Systems
- **ECE 423** Embedded Computer Systems
- **ME 262** Introduction to Microprocessors and Digital Logic
- **MTE 262** Introduction to Microprocessors and Digital Logic
- **MTE 325** Microprocessor Systems and Interfacing for Mechatronics Engineering
- **SYDE 192** Digital Systems

Software Engineering

- **CS 445/ECE 451** Software Requirements Specification and Analysis
- **CS 446/ECE 452** Software Design and Architectures
- **CS 447/ECE 453** Software Testing, Quality Assurance and Maintenance
- **MSCI 342** Principles of Software Engineering
- **SE 463** Software Requirements Specification and Analysis
- **SE 464** Software Design and Architectures
- **SE 465** Software Testing and Quality Assurance

Human-Computer Interaction

- **MSCI 343** Human-Computer Interaction
- **MSCI 541** Search Engines
- **MSCI 543** Analytics and User Experience
- **SYDE 542** Interface Design
- **SYDE 543** Cognitive Ergonomics
- **SYDE 548** User Centred Design Methods

Security and Privacy

- **ECE 409** Cryptography and System Security
- **ECE 458** Computer Security

Pattern Analysis and Machine Intelligence

- **ECE 417** Image Processing
- **ECE 457A** Co-operative and Adaptive Algorithms
- **ECE 457B** Fundamentals of Computational Intelligence
- **ECE 457C** Reinforcement Learning
- **MSCI 436** Decision Support Systems
- **MSCI 446** Introduction to Machine Learning
- **MSCI 546** Advanced Machine Learning
- **MTE 544** Autonomous Mobile Robotics
- **MTE 546** Multi-Sensor Data Fusion
- **SYDE 522** Foundations of Artificial Intelligence
- **SYDE 552/BIOL 487** Computational Neuroscience
- **SYDE 556** Simulating Neurobiological Systems
- **SYDE 572** Introduction to Pattern Recognition
- **SYDE 575** Image Processing

Numerical Methods

- **BME 411** Optimization and Numerical Methods
- **CHE 322** Numerical Methods for Process Analysis and Design
- **CIVE 422** Finite Element Analysis
- **EARTH 456** Numerical Methods in Hydrogeology
- **ECE 204** Numerical Methods
- **ECE 204A** Numerical Methods 1 and **ECE 204B** Numerical Methods 2
- **ENVE 225** Environmental Modelling
- **ME 559** Finite Element Methods
- **ME 566** Computational Fluid Dynamics for Engineering Design
- **MTE 204** Numerical Methods
- **NE 336** Micro and Nanosystem Computer-aided Design
- **SYDE 411** Optimization and Numerical Methods

Special topics courses as approved by the **option co-ordinator**.

4.9 Management Sciences Option

Summary:

Minor Modification:

Adding and removing courses

Background and Rationale:

Replace CIVE 596 (Construction Engineering) with CIVE 343 (Traffic Simulation Modelling and Applications) as it is better related to Management Sciences concepts.

Management Sciences Option

MARK UP

The Management Sciences Option is not available to Management Engineering students.

Legend

Key	Description
A,B,C	These courses count toward Complementary Studies Course Lists for Engineering : A- List A; B- List B; C- List C.
†	These courses may count towards technical elective (or technical breadth elective) requirements. Engineering students should consult the academic advisor in their home department for specific rules that apply to their academic plan.

Requirements

The Option consists of six courses, including two required courses (or their equivalents) and four elective courses (or equivalents).

- The two required courses and equivalents are:
 - **MSCI 211^C** Organizational Behaviour or **MSCI 311^C** Organizational Design and Technology; or **PSYCH 238** Organizational Psychology
 - **MSCI 331[†]** Introduction to Optimization; one of **BME 411**, **CHE 521**, **CIVE 332**, **CO 250**, **ENVE 335**, or **SYDE 411**
- Four of the following elective courses or equivalents:
 - **MSCI 211^C** Organizational Behaviour; or **PSYCH 238** Organizational Psychology
 - **MSCI 261^B** Engineering Economics: Financial Management for Engineers; one of **AE 392/CIVE 392/ENVE 392/GEOE 392**, **BME 364**, or **SYDE 262**
 - **MSCI 263^C** Managerial Economics; or **ECON 201** Microeconomic Theory for Business and Policy
 - **MSCI 311^C** Organizational Design and Technology
 - **MSCI 332[†]** Deterministic Optimization Models and Methods
 - **MSCI 411^C** Leadership and Influence; or **BET 450** Leadership
 - **MSCI 422^A** Economic Impact of Technological Change and Entrepreneurship
 - **MSCI 431[†]** Stochastic Models and Methods
 - **MSCI 432[†]** Production and Service Operations Management
 - **MSCI 433[†]** Applications of Management Engineering
 - **MSCI 435[†]** Advanced Optimization Techniques
 - **MSCI 442^A** Impact of Information Systems on Organizations and Society
 - **MSCI 446[†]** Introduction to Machine Learning; or one of **CS 480**, **ECE 457B**, **SYDE 522**
 - **MSCI 452[†]** Decision Making Under Uncertainty
 - **MSCI 454^C** Technical Entrepreneurship
 - **MSCI 531[†]** Stochastic Processes and Decision Making
 - **MSCI 541[†]** Search Engines
 - **MSCI 543[†]** Analytics and User Experience
 - **MSCI 546[†]** Advanced Machine Learning

- MSCI 551[†] Quality Management and Control
- MSCI 555[†] Scheduling: Theory and Practice
- MSCI 597 Complementary Studies Topics in Management Sciences
- MSCI 598[†] Special Topics in Management Engineering
- ~~CIVE 596 Construction Engineering~~
- **CIVE 343 Traffic Simulation Modelling and Applications**
- ECON 371 Business Finance 1
- HRM 200^C Basic Human Resources Management
- SYDE 531[†] Design Optimization Under Probabilistic Uncertainty
- SYDE 533 Conflict Resolution

Notes

1. At least three of the six courses must be MSCI courses from the Department of Management Sciences.
2. A maximum of one course from outside the approved list may be counted towards the Option, subject to approval of the **option co-ordinator**.
3. Students may take both **MSCI 211** and **MSCI 311**, in which case, one will count towards the required courses and the other toward the elective courses.

For further information about the Management Sciences Option, contact the **option co-ordinator** in the Management Sciences Department.

Management Sciences Option

CLEAN COPY

The Management Sciences Option is not available to Management Engineering students.

Legend

Key	Description
A,B,C	These courses count toward Complementary Studies Course Lists for Engineering : A- List A; B- List B; C- List C.
†	These courses may count towards technical elective (or technical breadth elective) requirements. Engineering students should consult the academic advisor in their home department for specific rules that apply to their academic plan.

Requirements

The Option consists of six courses, including two required courses (or their equivalents) and four elective courses (or equivalents).

- The two required courses and equivalents are:
 - MSCI 211^C Organizational Behaviour or MSCI 311^C Organizational Design and Technology; or PSYCH 238 Organizational Psychology
 - MSCI 331[†] Introduction to Optimization; one of BME 411, CHE 521, CIVE 332, CO 250, ENVE 335, or SYDE 411
- Four of the following elective courses or equivalents:
 - MSCI 211^C Organizational Behaviour; or PSYCH 238 Organizational Psychology
 - MSCI 261^B Engineering Economics: Financial Management for Engineers; one of AE 392/CIVE 392/ENVE 392/GEOE 392, BME 364, or SYDE 262
 - MSCI 263^C Managerial Economics; or ECON 201 Microeconomic Theory for Business and Policy
 - MSCI 311^C Organizational Design and Technology
 - MSCI 332[†] Deterministic Optimization Models and Methods
 - MSCI 411^C Leadership and Influence; or BET 450 Leadership
 - MSCI 422^A Economic Impact of Technological Change and Entrepreneurship

- **MSCI 431**[†] Stochastic Models and Methods
- **MSCI 432**[†] Production and Service Operations Management
- **MSCI 433**[†] Applications of Management Engineering
- **MSCI 435**[†] Advanced Optimization Techniques
- **MSCI 442**^A Impact of Information Systems on Organizations and Society
- **MSCI 446**[†] Introduction to Machine Learning; or one of **CS 480**, **ECE 457B**, **SYDE 522**
- **MSCI 452**[†] Decision Making Under Uncertainty
- **MSCI 454**^C Technical Entrepreneurship
- **MSCI 531**[†] Stochastic Processes and Decision Making
- **MSCI 541**[†] Search Engines
- **MSCI 543**[†] Analytics and User Experience
- **MSCI 546**[†] Advanced Machine Learning
- **MSCI 551**[†] Quality Management and Control
- **MSCI 555**[†] Scheduling: Theory and Practice
- **MSCI 597** Complementary Studies Topics in Management Sciences
- **MSCI 598**[†] Special Topics in Management Engineering
- **CIVE 343** Traffic Simulation Modelling and Applications
- **ECON 371** Business Finance 1
- **HRM 200**^C Basic Human Resources Management
- **SYDE 531**[†] Design Optimization Under Probabilistic Uncertainty
- **SYDE 533** Conflict Resolution

Notes

4. At least three of the six courses must be MSCI courses from the Department of Management Sciences.
5. A maximum of one course from outside the approved list may be counted towards the Option, subject to approval of the **option co-ordinator**.
6. Students may take both **MSCI 211** and **MSCI 311**, in which case, one will count towards the required courses and the other toward the elective courses.

For further information about the Management Sciences Option, contact the **option co-ordinator** in the Management Sciences Department.

4.10 Software Engineering Option

Summary:

Minor Modification:

- a) Add courses to related lists.
- b) Editorial text

Background & Rationale

Adding CS 137 (Programming Principles), CS 138 (Introduction to Data Abstraction and Implementation), MTE 544 (Autonomous Mobile Robotics), and MTE 546 (Multi-Sensor Data Fusion). The Computing, Computer Engineering (CE) and Software Engineering (SE) Options are specifically designed together to make it easy for students to switch between them. A common pathway will be that students pick the SE Option in second year, then want to switch to CE Option or Students who try to earn an Artificial Intelligence option, but fell short by one or two courses can fall back on the Computing option with these additions. If the lists are identical, then every course that they've taken for one option will still count towards the other two options.

Software Engineering Option

MARK UP

The Software Engineering Option is available to all students in the Faculty of Engineering (including Architecture), except students in Software Engineering.

This Option is offered jointly by the Faculty of Engineering and the David R. Cheriton School of Computer Science in the Faculty of Mathematics.

For students in the Faculty of Engineering, this Option requires a total of eight courses.

Three required courses:

CS 445/ECE 451 or SE 463 Software Requirements Specification and Analysis

CS 446/ECE 452 or SE 464 Software Design and Architectures

CS 447/ECE 453 or SE 465 Software Testing, Quality Assurance and Maintenance, or Software Testing and Quality Assurance

Four additional courses from the topics list below, one of which may be substituted with a course from the data structures and algorithms list.

One course from List A **Complementary Studies Course Lists for Engineering** that considers application of computing technology, or an alternative approved by the option co-ordinator.

The courses chosen to satisfy this Option must satisfy ~~four~~ **two** additional constraints:

~~They must satisfy Canadian Engineering Accreditation Board (CEAB) requirements.~~

~~They must be approved by the option co-ordinator.~~

Five of the courses must be considered elective (that is, not core requirements) in the student's academic plan. For the purposes of this Option, a course that a student could choose to graduate without will be considered elective.

The student must have earned a minimum average of 75% in the selected courses in order to have earned the Option.

Students may not declare this Option until they have completed both an introductory programming course and a data structures and algorithms course. Students must have a minimum average of 75% in these two courses in order to declare this Option.

The lists below are intended to be the same as for the **Computing Option** and the **Computer Engineering Option**. These lists are also intended to include courses that are normally part of the **Computing Minor** offered by the Cheriton School of Computer Science. Other courses from Computer Science may be used towards this Option with permission of the option co-ordinator. Students may declare ~~at most one of the Computing Option, Computer~~

Engineering Option, or Software Engineering Option. Students may change which of the three Options they declare by contacting the [option co-ordinator\(s\)](#).

Introductory Programming

[AE 121](#) Computational Methods
[BME 121](#) Digital Computation
[CHE 120](#) Computer Literacy and Programming for Chemical Engineers
[CIVE 121/ENVE 121/GEOE 121](#) Computational Methods
[CS 115](#) Introduction to Computer Science 1
[CS 116](#) Introduction to Computer Science 2
[CS 135](#) Designing Functional Programs
[CS 137 Programming Principles](#)
[CS 145](#) Designing Functional Programs (Advanced Level)
[ECE 150](#) Fundamentals of Programming
[ME 101](#) Introduction to Mechanical Engineering Practice 2
[MSCI 121](#) Introduction to Computer Programming
[MTE 121](#) Digital Computation
[NE 111](#) Introduction to Programming for Engineers
[SYDE 121](#) Digital Computation

Data Structures and Algorithms

[BME 122](#) Data Structures and Algorithms
[CS 136](#) Elementary Algorithm Design and Data Abstraction and [CS 136L](#) Tools and Techniques for Software Development (see Note)
[CS 138 Introduction to Data Abstraction and Implementation](#)
[CS 146](#) Elementary Algorithm Design and Data Abstraction (Advanced Level) and [CS 136L](#) Tools and Techniques for Software Development (see Note)
[CS 231](#) Algorithmic Problem Solving
[CS 234](#) Data Types and Structures
[ECE 250](#) Algorithms and Data Structures
[ECE 406](#) Algorithm Design and Analysis
[MSCI 240](#) Algorithms and Data Structures
[MTE 140](#) Algorithms and Data Structures
[SYDE 223](#) Data Structures and Algorithms

Note: Students who take [CS 136](#) or [CS 146](#) will also be required to enrol in [CS 136L](#) which is graded on a CR/NCR basis. However, passing [CS 136L](#) is not a requirement for the option and the course may be coded as [NRNA](#).

Topics List

The following list of topics are organized into specific areas for readability.

Logic

[CS 245](#) Logic and Computation
[ECE 208](#) Discrete Mathematics and Logic 2
[SE 212](#) Logic and Computation

Databases

[CS 338](#) Computer Applications in Business: Databases
[ECE 356](#) Database Systems
[MSCI 245](#) Databases and Software Design

Operating Systems

ECE 350 Real-Time Operating Systems
MTE 241 Introduction to Computer Structures and Real-Time Systems
SE 350 Operating Systems

Computing Systems

ECE 252 Systems Programming and Concurrency
ECE 351 Compilers
ECE 454 Distributed Computing
ECE 455 Embedded Software
ECE 459 Programming for Performance

Networks

ECE 358 Computer Networks

Digital Hardware

BME 393 Digital Systems
CS 230 Introduction to Computers and Computer Systems
ECE 124 Digital Circuits and Systems
ECE 222 Digital Computers
ECE 224 Embedded Microprocessor Systems
ECE 320 Computer Architecture
ECE 327 Digital Hardware Systems
ECE 423 Embedded Computer Systems
ME 262 Introduction to Microprocessors and Digital Logic
MTE 262 Introduction to Microprocessors and Digital Logic
MTE 325 Microprocessor Systems and Interfacing for Mechatronics Engineering
SYDE 192 Digital Systems

Software Engineering

CS 445/ECE 451 Software Requirements Specification and Analysis
CS 446/ECE 452 Software Design and Architectures
CS 447/ECE 453 Software Testing, Quality Assurance and Maintenance
MSCI 342 Principles of Software Engineering
SE 463 Software Requirements Specification and Analysis
SE 464 Software Design and Architectures
SE 465 Software Testing and Quality Assurance

Human-Computer Interaction

MSCI 343 Human-Computer Interaction
MSCI 541 Search Engines
MSCI 543 Analytics and User Experience
SYDE 542 Interface Design
SYDE 543 Cognitive Ergonomics
SYDE 548 User Centred Design Methods

Security and Privacy

ECE 409 Cryptography and System Security
ECE 458 Computer Security

Pattern Analysis and Machine Intelligence

ECE 417 Image Processing
ECE 457A Co-operative and Adaptive Algorithms
ECE 457B Fundamentals of Computational Intelligence
ECE 457C Reinforcement Learning
MSCI 436 Decision Support Systems
MSCI 446 Introduction to Machine Learning
MSCI 546 Advanced Machine Learning
MTE 544 Autonomous Mobile Robotics
MTE 546 Multi-Sensor Data Fusion
SYDE 522 Foundations of Artificial Intelligence
SYDE 552/BIOL 487 Computational Neuroscience
SYDE 556 Simulating Neurobiological Systems
SYDE 572 Introduction to Pattern Recognition
SYDE 575 Image Processing

Numerical Methods

BME 411 Optimization and Numerical Methods
CHE 322 Numerical Methods for Process Analysis and Design
CIVE 422 Finite Element Analysis
EARTH 456 Numerical Methods in Hydrogeology
ECE 204 Numerical Methods
ECE 204A Numerical Methods 1 and ECE 204B Numerical Methods 2
ENVE 225 Environmental Modelling
ME 559 Finite Element Methods
ME 566 Computational Fluid Dynamics for Engineering Design
MTE 204 Numerical Methods
NE 336 Micro and Nanosystem Computer-aided Design
SYDE 411 Optimization and Numerical Methods

Special topics courses as approved by the **option co-ordinator**.

Software Engineering Option

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The Software Engineering Option is available to all students in the Faculty of Engineering (including Architecture), except students in Software Engineering.

This Option is offered jointly by the Faculty of Engineering and the David R. Cheriton School of Computer Science in the Faculty of Mathematics.

For students in the Faculty of Engineering, this Option requires a total of eight courses.

- Three required courses:
 - CS 445/ECE 451 or SE 463 Software Requirements Specification and Analysis
 - CS 446/ECE 452 or SE 464 Software Design and Architectures
 - CS 447/ECE 453 or SE 465 Software Testing, Quality Assurance and Maintenance, or Software Testing and Quality Assurance
- Four additional courses from the topics list below, one of which may be substituted with a course from the data structures and algorithms list.
- One course from List A **Complementary Studies Course Lists for Engineering** that considers application of computing technology, or an alternative approved by the option co-ordinator.

The courses chosen to satisfy this Option must satisfy two additional constraints:

- Five of the courses must be considered elective (that is, not core requirements) in the student's academic plan. For the purposes of this Option, a course that a student could choose to graduate without will be considered elective.
- The student must have earned a minimum average of 75% in the selected courses in order to have earned the Option.

Students may not declare this Option until they have completed both an introductory programming course and a data structures and algorithms course. Students must have a minimum average of 75% in these two courses in order to declare this Option.

The lists below are intended to be the same as for the **Computing Option** and the **Computer Engineering Option**. These lists are also intended to include courses that are normally part of the **Computing Minor** offered by the Cheriton School of Computer Science. Other courses from Computer Science may be used towards this Option with permission of the option co-ordinator. Students may declare at most one of the Computing Option, Computer Engineering Option, or Software Engineering Option. Students may change which of the three Options they declare by contacting the **option co-ordinator(s)**.

Introductory Programming

- **AE 121** Computational Methods
- **BME 121** Digital Computation
- **CHE 120** Computer Literacy and Programming for Chemical Engineers
- **CIVE 121/ENVE 121/GEOE 121** Computational Methods
- **CS 115** Introduction to Computer Science 1
- **CS 116** Introduction to Computer Science 2
- **CS 135** Designing Functional Programs
- **CS 137** Programming Principles
- **CS 145** Designing Functional Programs (Advanced Level)
- **ECE 150** Fundamentals of Programming
- **ME 101** Introduction to Mechanical Engineering Practice 2
- **MSCI 121** Introduction to Computer Programming
- **MTE 121** Digital Computation
- **NE 111** Introduction to Programming for Engineers
- **SYDE 121** Digital Computation

Data Structures and Algorithms

- **BME 122** Data Structures and Algorithms
- **CS 136** Elementary Algorithm Design and Data Abstraction and **CS 136L** Tools and Techniques for Software Development (see Note)
- **CS 138** Introduction to Data Abstraction and Implementation
- **CS 146** Elementary Algorithm Design and Data Abstraction (Advanced Level) and **CS 136L** Tools and Techniques for Software Development (see Note)
- **CS 231** Algorithmic Problem Solving
- **CS 234** Data Types and Structures
- **ECE 250** Algorithms and Data Structures
- **ECE 406** Algorithm Design and Analysis
- **MSCI 240** Algorithms and Data Structures
- **MTE 140** Algorithms and Data Structures
- **SYDE 223** Data Structures and Algorithms

Note: Students who take **CS 136** or **CS 146** will also be required to enrol in **CS 136L** which is graded on a CR/NCR basis. However, passing **CS 136L** is not a requirement for the option and the course may be coded as **NRNA**.

The following list of topics are organized into specific areas for readability.

Logic

- **CS 245** Logic and Computation
- **ECE 208** Discrete Mathematics and Logic 2
- **SE 212** Logic and Computation

Databases

- **CS 338** Computer Applications in Business: Databases
- **ECE 356** Database Systems
- **MSCI 245** Databases and Software Design

Operating Systems

- **ECE 350** Real-Time Operating Systems
- **MTE 241** Introduction to Computer Structures and Real-Time Systems
- **SE 350** Operating Systems

Computing Systems

- **ECE 252** Systems Programming and Concurrency
- **ECE 351** Compilers
- **ECE 454** Distributed Computing
- **ECE 455** Embedded Software
- **ECE 459** Programming for Performance

Networks

- **ECE 358** Computer Networks

Digital Hardware

- **BME 393** Digital Systems
- **CS 230** Introduction to Computers and Computer Systems
- **ECE 124** Digital Circuits and Systems
- **ECE 222** Digital Computers
- **ECE 224** Embedded Microprocessor Systems
- **ECE 320** Computer Architecture
- **ECE 327** Digital Hardware Systems
- **ECE 423** Embedded Computer Systems
- **ME 262** Introduction to Microprocessors and Digital Logic
- **MTE 262** Introduction to Microprocessors and Digital Logic
- **MTE 325** Microprocessor Systems and Interfacing for Mechatronics Engineering
- **SYDE 192** Digital Systems

Software Engineering

- **CS 445/ECE 451** Software Requirements Specification and Analysis
- **CS 446/ECE 452** Software Design and Architectures
- **CS 447/ECE 453** Software Testing, Quality Assurance and Maintenance
- **MSCI 342** Principles of Software Engineering
- **SE 463** Software Requirements Specification and Analysis
- **SE 464** Software Design and Architectures
- **SE 465** Software Testing and Quality Assurance

Human-Computer Interaction

- **MSCI 343** Human-Computer Interaction
- **MSCI 541** Search Engines
- **MSCI 543** Analytics and User Experience
- **SYDE 542** Interface Design
- **SYDE 543** Cognitive Ergonomics
- **SYDE 548** User Centred Design Methods

Security and Privacy

- **ECE 409** Cryptography and System Security
- **ECE 458** Computer Security

Pattern Analysis and Machine Intelligence

- **ECE 417** Image Processing
- **ECE 457A** Co-operative and Adaptive Algorithms
- **ECE 457B** Fundamentals of Computational Intelligence
- **ECE 457C** Reinforcement Learning
- **MSCI 436** Decision Support Systems
- **MSCI 446** Introduction to Machine Learning
- **MSCI 546** Advanced Machine Learning
- **MTE 544** Autonomous Mobile Robotics
- **MTE 546** Multi-Sensor Data Fusion
- **SYDE 522** Foundations of Artificial Intelligence
- **SYDE 552/BIOL 487** Computational Neuroscience
- **SYDE 556** Simulating Neurobiological Systems
- **SYDE 572** Introduction to Pattern Recognition
- **SYDE 575** Image Processing

Numerical Methods

- **BME 411** Optimization and Numerical Methods
- **CHE 322** Numerical Methods for Process Analysis and Design
- **CIVE 422** Finite Element Analysis
- **EARTH 456** Numerical Methods in Hydrogeology
- **ECE 204** Numerical Methods
- **ECE 204A** Numerical Methods 1 and **ECE 204B** Numerical Methods 2
- **ENVE 225** Environmental Modelling
- **ME 559** Finite Element Methods
- **ME 566** Computational Fluid Dynamics for Engineering Design
- **MTE 204** Numerical Methods
- **NE 336** Micro and Nanosystem Computer-aided Design
- **SYDE 411** Optimization and Numerical Methods

Special topics courses as approved by the **option co-ordinator**.

4.11 Complementary Studies Electives

Summary:

Minor Modification:

Add courses to the CSE Lists

Background & Rationale

CSE lists are being revised to create more student flexibility for students. The courses being added (and, for reference, the CSE lists) are as follows:

List A: Impact of Technology and /or Engineering on Society

List B: Engineering Economics

List C: Humanities and Social Sciences

List D: Humanities and Social Sciences

- CO 480 [List C]
- GER 130 [C]
- All HHUM courses, except HHUM391 [C] (Note: HHUM = health humanities)
- DAC 201 / ENGL 203 [D]
- DAC 202 / ENGL 204 [D]
- DAC 203 / ENGL 304 [D]
- DAC 204 [D]
- DAC 302 [D]
- DAC 303 [D]
- DAC 305 [D]
- DAC 307 [D]
- DAC 308 [D]
- DAC 309 [D]
- DAC 329 / COMMST 329 [D]
- ERS 200 [C]
- ERS 265 [C]
- GEOG 414 [C]

Calendar descriptions of these courses are included in the appendix 5.3. Units offering the new courses have been consulted.

Complementary Studies Course Lists for Engineering

MARK UP

Requirements for all Engineering plans (Bachelor of Applied Science or Bachelor of Software Engineering) include the development of non-technical knowledge and skills to complement technical knowledge and skills. Specific Engineering plans refer to one or more of the following lists of courses that contain substantial complementary studies content:

List A: Impact of Technology and/or Engineering on Society

List B: Engineering Economics

List C: Humanities and Social Sciences (excluding courses concentrated on development of language or

other skills)

List D: Humanities and Social Sciences (courses concentrated on development of language or other skills)

Notes

1. In exceptional circumstances, academic advisors may deem a course that is not included in one of the lists below to be a reasonable fit for one or more of the lists. Normally such consideration will be given only for special topics or project courses where the advisor determines that the topic of the course or project is suitable, or in cases when students are returning from exchange, being offered advanced admission, transferring to Engineering from a non-Engineering plan, taking a secondary plan (e.g., a minor) that involves courses not normally available to Engineering students, or taking a course at another institution via a Letter of Permission.
2. Rarely, plan requirements may stipulate that students in that plan are not permitted to count a certain course in List A, B, C, or D even though the course is included in one or more of the lists below. See individual plan requirements for details.
3. Unless permitted otherwise in the individual plan requirements, a course that appears in more than one of the four lists below may be counted only once; for example, [STV 100](#) may be counted as a List A course or a List C course, but not both.
4. Access to most courses in the lists below is not controlled by Engineering, and successful enrolment is not guaranteed. Some courses may not be offered in the current academic year, scheduling conflicts may be unavoidable, the demand for some courses may be higher than can be accommodated, and enrolment in some courses requires instructor consent.
5. Most upper-year courses have prerequisites or minimum expectations about student background. Students are responsible for ensuring that they meet the necessary prerequisites and background for all courses.
6. Some courses in List D are restricted to those who have a certain minimum or maximum background skill level (e.g., [CHINA 101R](#) is open only to students with little or no prior background in the Chinese language and [MUSIC 111](#) is open only to students with minimal musical background). Students interested in one of these courses may be assessed by the department offering the course to determine if their background skill level is suitable, and on that basis the department has the right to refuse admission to, or grant credit for, courses.

Complementary Studies Course Lists

List A - Impact of Technology and/or Engineering on Society

- [ANTH 106](#)
- [BET 360](#), [BET 420](#)
- [BME 381](#)
- [CS 492](#)
- [ENVS 105](#), [ENVS 205](#)
- [ERS 215](#), [ERS 315](#)
- [GENE 22A](#)
- [GEOG 203](#), [GEOG 207](#), [GEOG 306](#), [GEOG 368/PLAN 341](#)
- [GSJ 205](#)
- [MSCI 422](#), [MSCI 442](#)
- [NE 109](#)
- [PACS 315](#)
- [PHIL 226](#)
- [SOC 232](#), [SOC 324](#)

- [STV 100](#), [STV 202](#), [STV 205](#), [STV 208](#), [STV 210/HIST 212](#), [STV 302](#), [STV 304](#), [STV 305](#), [STV 306](#)
- [SYDE 261](#)

List B - Engineering Economics

- [AE 392/CIVE 392/ENVE 392/GEOE 392](#)
- [BME 364](#)
- [GENE 22B](#)
- [MSCI 261](#)
- [SYDE 262](#)

List C - Humanities and Social Sciences (excluding courses concentrated on development of language or other skills)

- Accounting and Financial Management: [AFM 131/ARBUS 101](#), [AFM 333/ARBUS 301](#)
- Anthropology: All [ANTH](#), except [ANTH 204](#), [ANTH 251](#), [ANTH 289](#), [ANTH 305](#), [ANTH 345](#), [ANTH 355](#), [ANTH 365](#), [ANTH 371](#), [ANTH 372](#), [ANTH 377](#), [ANTH 389](#), [ANTH 391](#), [ANTH 395](#), [ANTH 455](#), [ANTH 489](#), [ANTH 498](#), [ANTH 499A](#), [ANTH 499B](#)
- Applied Language Studies: All [APPLS](#)
- Architectural Engineering: [AE 101](#), [AE 491](#)
- Arts: [ARTS 122](#), [ARTS 450](#)
- Aviation: [AVIA 100](#)
- Biomedical Engineering: [BME 381](#), [BME 530](#)
- Black Studies: [BLKST 101](#), [BLKST 102/VCULT 112/COMMST 112/THPERF 112](#), [BLKST 103](#), [BLKST 201](#), [BLKST 202](#), [BLKST 203/ENGL 225](#), [BLKST 210/ENGL 326](#), [BLKST 224/COMMST 224/THPERF 224](#), [BLKST 230](#), [BLKST 240/ENGL 327](#), [BLKST 244/ENGL 328](#), [BLKST 302](#), [BLKST 304/PSCI 304](#), [BLKST 309](#), [BLKST 317/SPAN 317](#), [BLKST 330](#), [BLKST 410/ENGL 405](#), [BLKST 421](#)
- Business Entrepreneurship and Technology: [BET 100](#), [BET 300](#), [BET 320](#), [BET 340](#), [BET 350](#), [BET 400](#), [BET 411](#), [BET 420](#), [BET 430](#), [BET 450](#), [BET 460](#), [BET 470](#), [BET 580](#)
- Canadian Studies: All [CDNST](#)
- Church Music and Worship: [CMW 363/MUSIC 363/RS 357](#), [CMW 364/MUSIC 364/RS 358](#)
- Civil Engineering: [CIVE 491](#)
- Classical Studies: All [CLAS](#), except [CLAS 390](#), [CLAS 400-level courses](#)
- Cognitive Science: [COGSCI 300/PHIL 356](#)
- **[Combinatorics and Optimization: CO 480](#)**
- Commerce: [COMM 400](#)
- Communication Studies: [COMMST 101](#), [COMMST 112/BLKST 102/VCULT 112/THPERF 112](#), [COMMST 201](#), [COMMST 210](#), [COMMST 224/BLKST 224/THPERF 224](#), [COMMST 226](#), [COMMST 228](#), [COMMST 335](#), [COMMST 339](#), [COMMST 399](#), [COMMST 401](#), [COMMST 402](#), [COMMST 420](#), [COMMST 430/LS 492](#), [COMMST 431](#), [COMMST 432](#), [COMMST 434/ENGL 309G/GSJ 309/HIST 309](#), [COMMST 435](#), [COMMST 471/LS 471](#), [COMMST 475](#), [COMMST 479](#)
- Computer Science: [CS 492](#)
- Cultural Identities: [CI 100](#), [CI 200/GER 200](#), [CI 250](#), [CI 300/SPAN 300](#), [CI 329/SPAN 329](#)
- Dutch: [DUTCH 271](#)
- East Asian Studies: All [EASIA](#), except [EASIA 250R](#), [EASIA 291R](#), [EASIA 391R](#)
- Economics: All [ECON](#), except [ECON 100/COMM 103](#), [ECON 211](#), [ECON 221](#), [ECON 290](#), [ECON 311](#), [ECON 322](#), [ECON 323](#), [ECON 361](#), [ECON 363](#), [ECON 371](#), [ECON 372](#), [ECON 381](#), [ECON 382](#), [ECON 391](#), [ECON 392](#), [ECON 412](#), [ECON 42x-level courses](#), [ECON 452](#), [ECON 456](#), [ECON 47x-level courses](#), [ECON 48x-level courses](#), [ECON 49x-level courses](#)

- English: All [ENGL](#), except [ENGL 109](#), [ENGL 119](#), [ENGL 129R/EMLS 129R](#), [ENGL 140R](#), [ENGL 191/COMMST 191](#), [ENGL 192/COMMST 192](#), [ENGL 193/COMMST 193](#), [ENGL 203/DAC 201](#), [ENGL 204/DAC 202](#), [ENGL 209](#), [ENGL 210E](#), [ENGL 210F](#), [ENGL 210G](#), [ENGL 210H](#), [ENGL 210I/LS 291](#), [ENGL 210J](#), [ENGL 303/DAC 300/COMMST 300](#), [ENGL 304/DAC 203](#), [ENGL 306A](#), [ENGL 306B](#), [ENGL 306G](#), [ENGL 309E/COMMST 323](#), [ENGL 373/BLKST 308](#), [ENGL 375/BLKST 310](#), [ENGL 378/MTHEL 300](#), [ENGL 403/DAC 400](#), [ENGL 408B](#), [ENGL 408C](#), [ENGL 472](#), [ENGL 48x-level courses](#), [ENGL 49x-level courses](#)
- Environment and Business: [ENBUS 102](#), [ENBUS 112](#), [ENBUS 203](#), [ENBUS 211](#), [ENBUS 302](#), [ENBUS 309](#), [ENBUS 310](#), [ENBUS 315](#), [ENBUS 405](#), [ENBUS 408](#), [ENBUS 411](#)
- Environment, Resources and Sustainability: [ERS 100](#), [ERS 200](#), [ERS 215](#), [ERS 222](#), [ERS 225](#), [ERS 253](#), [ERS 288/ENGL 248](#), [ERS 265](#), [ERS 294/RS 285](#), [ERS 315](#), [ERS 320](#), [ERS 328](#), [ERS 361/GEOG 361](#), [ERS 365](#), [ERS 370](#), [ERS 372](#), [ERS 404/PSCI 432](#), [ERS 406](#), [ERS 454](#), [ERS 460/GEOG 460](#), [ERS 462/GEOG 462/PSCI 488](#)
- Environment: [ENVS 105](#), [ENVS 195](#), [ENVS 201](#), [ENVS 205](#), [ENVS 210](#), [ENVS 220](#), [ENVS 310](#), [ENVS 350](#), [ENVS 401](#)
- Environmental Engineering: [ENVE 391/GEOE 391](#)
- Fine Arts: [FINE 101/VCULT 101](#), [FINE 102/VCULT 100](#), [FINE 112](#), [FINE 209](#), [FINE 210](#), [FINE 212](#), [FINE 213](#), [FINE 214](#), [FINE 215](#), [FINE 216/INDG 216](#), [FINE 217](#), [FINE 241/CLAS 241](#), [FINE 242/CLAS 242](#), [FINE 244](#), [FINE 245](#), [FINE 252/RS 270](#), [FINE 256](#), [FINE 257](#), [FINE 258](#), [FINE 259](#), [FINE 262/GSJ 262](#), [FINE 275/EASIA 231R/SI 231R](#), [FINE 281](#), [FINE 282](#), [FINE 319](#), [FINE 338/PHIL 331](#), [FINE 341/CLAS 341](#), [FINE 342/CLAS 342](#), [FINE 362/GER 362](#), [FINE 364/GER 364/REES 364](#), [FINE 368](#), [FINE 377/RS 377](#)
- French Studies: [FR 276](#), [FR 291](#), [FR 292](#), [FR 296](#), [FR 297](#), [FR 332](#), [FR 343](#), [FR 354](#), [FR 363](#), [FR 365](#), [FR 367](#), [FR 373](#), [FR 375](#), [FR 410](#), [FR 424](#), [FR 471](#), [FR 473](#), [FR 484](#), [FR 485](#), [FR 487](#)
- Gender and Social Justice: All [GSJ](#), except [GSJ 271](#), [GSJ 371](#), [GSJ 401/HLTH 401](#), [GSJ 402/PHIL 402](#), [GSJ 408/REC 408](#), [GSJ 410/ENGL 410](#), [GSJ 463/ENGL 463](#), [GSJ 472](#), [GSJ 473](#)
- General Engineering: [GENE 22C](#), [GENE 315](#), [GENE 415](#)
- Geological Engineering: [GEOE 391/ENVE 391](#)
- Geography and Environmental Management: [GEOG 101](#), [GEOG 202](#), [GEOG 203](#), [GEOG 207](#), [GEOG 215](#), [GEOG 219](#), [GEOG 222](#), [GEOG 225](#), [GEOG 233](#), [GEOG 302](#), [GEOG 306](#), [GEOG 307](#), [GEOG 314](#), [GEOG 323/REC 383](#), [GEOG 325](#), [GEOG 336](#), [GEOG 349/PLAN 349](#), [GEOG 361/ERS 361](#), [GEOG 368/PLAN 341](#), [GEOG 411](#), [GEOG 414](#), [GEOG 423](#), [GEOG 432/HLTH 420/PLAN 432](#), [GEOG 460/ERS 460](#), [GEOG 462/ERS 462/PSCI 488](#)
- German: [GER 100](#), [GER 120/REES 220](#), [GER 130](#), [GER 180/REES 180](#), [GER 200/CI 200](#), [GER 230](#), [GER 261/REES 261](#), [GER 262/REES 262](#), [GER 271](#), [GER 272](#), [GER 283/JS 233/RS 272](#), [GER 286/PHIL 286J](#), [GER 301/APPLS 301](#), [GER 330](#), [GER 362/FINE 362](#), [GER 363/FINE 363](#), [GER 364/FINE 364/REES 364](#), [GER 383](#), [GER 385/REES 385](#)
- Gerontology: [GERON 201/HLTH 201](#), [GERON 218/HLTH 218/PSYCH 218](#), [GERON 352/KIN 352/HLTH 352/REC 362/SOC 352](#)
- Greek: [GRK 421](#)
- **Health Humanities: All HHUM, except HHUM 391**
- History: All [HIST](#), except [HIST 391](#), [HIST 397](#), [HIST 398](#), [HIST 400-level courses](#)
- Human Resources Management: [HRM 200](#)
- Human Rights: All [HRTS](#), except [HRTS 390](#), [HRTS 490](#)
- Human Sciences: [HUMSC 101](#), [HUMSC 102](#), [HUMSC 201](#), [HUMSC 301](#), [HUMSC 401](#), [HUMSC 490](#)
- Indigenous Entrepreneurship: [INDENT 200](#), [INDENT 210](#)
- Indigenous Studies: All [INDG](#), except [INDG 101/MOHAWK 101R](#), [INDG 102/MOHAWK 102R](#)
- International Development: [INDEV 100](#), [INDEV 101](#), [INDEV 200](#), [INDEV 212](#), [INDEV 262/PLAN 262](#), [INDEV 300/PHIL 227](#), [INDEV 302](#), [INDEV 308](#), [INDEV 387](#), [INDEV 404](#), [INDEV 475](#), [INDEV 478](#)

- International Studies: [INTST 101](#)
- Italian Studies: All [ITALST](#), except [ITALST 296](#), [ITALST 394](#), [ITALST 396](#)
- Jewish Studies: All [JS](#), except [JS 350](#), [JS 450](#)
- Kinesiology: [KIN 352/GERON 352/HLTH 352/REC 362/SOC 352](#), [KIN 354](#)
- Knowledge Integration: [INTEG 120](#), [INTEG 220/PHIL 290](#), [INTEG 221/PHIL 291](#), [INTEG 240](#), [INTEG 251](#)
- Latin: [LAT 202](#), [LAT 331](#), [LAT 332](#), [LAT 381](#), [LAT 421](#)
- Legal Studies: All [LS](#), except [LS 203](#), [LS 221/SOC 221](#), [LS 229/SOC 229](#), [LS 280/SOC 280](#), [LS 283/AFM 231](#), [LS 322/SOC 322](#), [LS 330](#), [LS 403](#), [LS 404](#), [LS 405](#), [LS 413/SOC 413](#), [LS 419/SOC 419](#), [LS 422/SOC 422](#), [LS 423/SOC 423](#), [LS 425/SOC 425](#), [LS 426/SOC 426](#), [LS 428/SOC 428](#), [LS 431](#), [LS 433/SOC 433](#), [LS 434/SOC 434](#), [LS 435/SOC 435](#), [LS 461/SOC 461](#), [LS 496](#), [LS 498](#)
- Management: [MGMT 220](#), [MGMT 244/ARBUS 302](#), [MGMT 345/ARBUS 303](#)
- Management Sciences: [MSCI 211](#), [MSCI 263](#), [MSCI 311](#), [MSCI 411](#), [MSCI 422](#), [MSCI 442](#), [MSCI 454](#)
- Medieval Studies: All [MEDVL](#), except [MEDVL 291](#), [MEDVL 391](#), [MEDVL 491](#)
- Mennonite Studies: [MENN 125](#)
- Music: [MUSIC 100](#), [MUSIC 110](#), [MUSIC 140](#), [MUSIC 231](#), [MUSIC 232](#), [MUSIC 240](#), [MUSIC 246](#), [MUSIC 253](#), [MUSIC 254](#), [MUSIC 255](#), [MUSIC 256](#), [MUSIC 260](#), [MUSIC 261](#), [MUSIC 262](#), [MUSIC 332](#), [MUSIC 333](#), [MUSIC 334/GSJ 334](#), [MUSIC 335/PACS 335](#), [MUSIC 361](#), [MUSIC 362](#), [MUSIC 363/CMW 363/RS 357](#), [MUSIC 364/CMW 364/RS 358](#)
- Nanotechnology Engineering: [NE 109](#)
- Peace and Conflict Studies: All [PACS](#), except [PACS 290](#), [PACS 301](#), [PACS 302](#), all [PACS 39x-level courses](#), all [PACS 400-level courses](#)
- Philosophy: All [PHIL](#), except [PHIL 216](#), [PHIL 240](#), [PHIL 252/SCI 252](#), [PHIL 271](#), [PHIL 340](#), [PHIL 350](#), [PHIL 355](#), [PHIL 358](#), [PHIL 371](#), [PHIL 40x-level courses](#), [PHIL 41x-level courses](#), [PHIL 42x-level courses](#), [PHIL 43x-level courses](#), [PHIL 44x-level courses](#), [PHIL 452](#), [PHIL 455](#), [PHIL 458](#), [PHIL 459](#), [PHIL 46x-level courses](#), [PHIL 47x-level courses](#), [PHIL 48x-level courses](#), [PHIL 49x-level courses](#)
- Planning: [PLAN 100](#), [PLAN 262/INDEV 262](#), [PLAN 341/GEOG 368](#), [PLAN 349/GEOG 349](#), [PLAN 362](#), [PLAN 414/REC 425](#), [PLAN 415](#), [PLAN 431](#), [PLAN 432/GEOG 432/HLTH 420](#), [PLAN 433](#), [PLAN 471](#)
- Political Science: All [PSCI](#), except [PSCI 299](#), [PSCI 314](#), [PSCI 315](#), [PSCI 360](#), [PSCI 390](#), [PSCI 391](#), [PSCI 400](#), [PSCI 403](#), [PSCI 426](#), [PSCI 433](#), [PSCI 437](#), [PSCI 485](#), [PSCI 49x-level courses](#)
- Psychology: All [PSYCH](#), except [PSYCH 207](#), [PSYCH 261](#), [PSYCH 264](#), [PSYCH 291](#), [PSYCH 292](#), [PSYCH 306](#), [PSYCH 307](#), [PSYCH 335](#), [PSYCH 363](#), [PSYCH 375R](#), [PSYCH 389](#), [PSYCH 39x-level courses](#), [PSYCH 420](#), [PSYCH 447/PHIL 447](#), [PSYCH 45x-level courses](#), [PSYCH 46x-level courses](#), [PSYCH 47x-level courses](#), [PSYCH 48x-level courses](#), [PSYCH 49x-level courses](#)
- Public Health Sciences: [HLTH 101](#), [HLTH 102](#), [HLTH 201/GERON 201](#), [HLTH 218/GERON 218/PSYCH 218](#), [HLTH 245/GERON 245](#), [HLTH 253/SOC 253](#), [HLTH 260/GSJ 260](#), [HLTH 301](#), [HLTH 320/GERON 320](#), [HLTH 352/GERON 352/KIN 352/REC 362/SOC 352](#), [HLTH 380/GSJ 380](#), [HLTH 412](#), [HLTH 420/GEOG 432/PLAN 432](#)
- Recreation and Leisure Studies: [REC 100](#), [REC 101](#), [REC 200](#), [REC 201](#), [REC 202/HIST 205](#), [REC 203/SOC 210](#), [REC 206/PHIL 206](#), [REC 219](#), [REC 230](#), [REC 280](#), [REC 306/GSJ 306](#), [REC 319](#), [REC 356](#), [REC 361](#), [REC 362/GERON 352/HLTH 352/KIN 352/SOC 352](#), [REC 383/GEOG 323](#), [REC 408/GSJ 408](#), [REC 422](#), [REC 425/PLAN 414](#)
- Religious Studies: All [RS](#), except [RS 101/GRK 101](#), [RS 102/GRK 102](#), [RS 223/GRK 201](#), [RS 224/GRK 202](#), [RS 271/FINE 253](#), [RS 291](#), [RS 391](#), [RS 395](#), [RS 398](#), [RS 462/SOC 402](#), [RS 491](#), [RS 495](#), [RS 498](#), [RS 499](#)
- Russian and East European Studies: All [REES](#), except [REES 260](#)
- Science: [SCI 266/PHIL 260/CLAS 260](#), [SCI 267/PHIL 258](#)

- Sexuality, Marriage, and Family Studies: All [SMF](#), except [SMF 200](#), [SMF 220](#), [SMF 230](#), [SMF 310](#), [SMF 365](#), [SMF 366](#), [SMF 400-level courses](#)
- Social Development Studies: All [SDS](#), except [SDS 150R](#), [SDS 250R/SWREN 250R](#), [SDS 251R/SWREN 251R](#), [SDS 370R](#), [SDS 375R](#), [SDS 398R](#), [SDS 399R](#), [SDS 450R](#), [SDS 451R](#), [SDS 49x-level courses](#)
- Social Work: All [SOCWK](#), except [SOCWK 375R](#), [SOCWK 390A](#), [SOCWK 390B](#), [SOCWK 398R](#), [SOCWK 399R](#), [SOCWK 450R](#), [SOCWK 490R](#)
- Society, Technology and Values: All [STV](#), except [STV 201](#), [STV 400](#), [STV 401](#)
- Sociology: All [SOC](#), except [SOC 221/LS 221](#), [SOC 229/LS 229](#), [SOC 230](#), [SOC 280/LS 280](#), [SOC 322/LS 322](#), [SOC 330](#), [SOC 362](#), [SOC 375R](#), [SOC 398R](#), [SOC 399R](#), [SOC 40x-level courses](#), [SOC 41x-level courses](#), [SOC 42x-level courses](#), [SOC 430](#), [SOC 432](#), [SOC 433/LS 433](#), [SOC 434/LS 434](#), [SOC 435/LS 435](#), [SOC 436](#), [SOC 44x-level courses](#), [SOC 45x-level courses](#), [SOC 46x-level courses](#), [SOC 49x-level courses](#)
- Spanish: [SPAN 150](#), [SPAN 217](#), [SPAN 234](#), [SPAN 300/CI 300](#), [SPAN 317/BLKST 317](#), [SPAN 326](#), [SPAN 329/CI 329](#), [SPAN 387](#), [SPAN 400](#), [SPAN 410](#), [SPAN 430/GSJ 430](#)
- Studies in Islam: All [SI](#), except [SI 375R](#)
- Systems Design Engineering: [SYDE 261](#)
- Theatre and Performance: [THPERF 112/BLKST 102/VCULT 112/ COMMST 112](#), [THPERF 200](#), [THPERF 224/BLKST 224/COMMST 224](#), [THPERF 246](#), [THPERF 248](#), [THPERF 278](#), [THPERF 280](#), [THPERF 282](#), [THPERF 300](#), [THPERF 371](#), [THPERF 374](#), [THPERF 376](#), [THPERF 378](#), [THPERF 386/ENGL 362](#), [THPERF 387/ENGL 363](#)
- Visual Culture: [VCULT 100/FINE 102](#), [VCULT 101/FINE 101](#), [VCULT 112/BLKST 102/COMMST 102/THPERF 112](#), [VCULT 200](#), [VCULT 300](#)

List D - Humanities and Social Sciences (courses concentrated on development of language or other skills)

- American Sign Language: All [ASL](#)
- Anthropology: [ANTH 251](#)
- Arabic: All [ARABIC](#)
- Black Studies: [BLKST 303](#), [BLKST 308/ENGL 373](#), [BLKST 310/ENGL 375](#), [BLKST 380/THPERF 380](#), [BLKST 499](#)
- Chinese: All [CHINA](#), except [CHINA 391R](#)
- Communication Studies: [COMMST 100](#), [COMMST 102/THPERF 102](#), [COMMST 149/THPERF 149/DAC 209](#), [COMMST 191/ ENGL 191](#), [COMMST 192/ENGL 192](#), [COMMST 220/THPERF 220](#), [COMMST 223](#), [COMMST 325](#), [COMMST 326/ THPERF 326](#), [COMMST 329/DAC 329](#), [COMMST 433](#), [COMMST 440/THPERF 440](#)
- Croatian: [CROAT 101](#), [CROAT 102](#)
- **Digital Arts Communication: [DAC 201/ENGL 203](#), [DAC 202/ENGL 204](#), [DAC 203/ENGL 304](#), [DAC 204](#), [DAC 209/COMMST 149/ THPERF 149](#), [DAC 302](#), [DAC 303](#), [DAC 305](#), [DAC 307](#), [DAC 308](#), [DAC 309](#), [DAC 329/COMMST 329](#)**
- Dutch: [DUTCH 101](#), [DUTCH 102](#)
- English: [ENGL 109](#), [ENGL 119](#), [ENGL 129R/EMLS 129R](#), [ENGL 140R](#), [ENGL 191/COMMST 191](#), [ENGL 192/COMMST 192](#), [ENG 203/DAC 201](#), [ENGL 204/ DAC 202](#), [ENGL 209](#), [ENGL 210E](#), [ENGL 210F](#), [ENGL 210G](#), [ENGL 210H](#), [ENGL 210I/LS 291](#), [ENGL 210J](#), [ENGL 304/DAC 203](#), [ENGL 306A](#), [ENGL 306B](#), [ENGL 306G](#), [ENGL 309E/ COMMST 323](#), [ENGL 373/BLKST 308](#), [ENGL 375/BLKST 310](#), [ENGL 408B](#), [ENGL 408C](#)
- English for Multilingual Speakers: All [EMLS](#)
- Environment: [ENVS 131](#)
- Environment, Resources and Sustainability: [ERS 318](#)

- Fine Arts: [FINE 130](#), [FINE 150](#)
- French Studies: [FR 101](#), [FR 151](#), [FR 152](#), [FR 192A](#), [FR 192B](#), [FR 203](#), [FR 250](#), [FR 251](#), [FR 252](#), [FR 255](#), [FR 303](#), [FR 351](#), [FR 353](#), [FR 355](#), [FR 400](#), [FR 452](#)
- General Engineering: [GENE 22D](#), [GENE 315](#), [GENE 415](#)
- Geography and Environmental Management: [GEOG 417](#)
- German: [GER 101](#), [GER 102](#), [GER 201](#), [GER 202](#), [GER 211](#), [GER 250](#), [GER 261/REES 261](#), [GER 303](#), [GER 304](#), [GER 307](#), [GER 308](#), [GER 331](#), [GER 350](#)
- Greek: [GRK 101/RS 101](#), [GRK 102/RS 102](#), [GRK 105](#), [GRK 201/RS 223](#), [GRK 202/RS 224](#), [GRK 331](#), [GRK 332](#), [GRK 351](#), [GRK 451](#)
- Health: [HEALTH 100](#), [HEALTH 105](#)
- Indigenous Studies: [INDG 101/MOHAWK 101R](#), [INDG 102/MOHAWK 102R](#)
- Italian: All [ITAL](#), except [ITAL 396](#)
- Japanese: All [JAPAN](#), except [JAPAN 391R](#)
- Knowledge Integration: [INTEG 210](#), [INTEG 410](#)
- Korean: All [KOREA](#), except [KOREA 391R](#)
- Latin: [LAT 101](#), [LAT 102](#), [LAT 201](#), [LAT 351](#), [LAT 422](#), [LAT 451](#)
- Mohawk: [MOHAWK 101R/INDG 101](#), [MOHAWK 102R/INDG 102](#)
- Music: [MUSIC 111](#), [MUSIC 222](#), [MUSIC 226](#), [MUSIC 227](#), [MUSIC 233](#), [MUSIC 270](#), [MUSIC 271](#), [MUSIC 275](#), [MUSIC 322](#), [MUSIC 370](#), [MUSIC 371](#), [MUSIC 376](#)
- Portuguese: [PORT 101](#), [PORT 102](#)
- Religious Studies: [RS 101/GRK 101](#), [RS 102/GRK 102](#), [RS 223/GRK 201](#), [RS 224/GRK 202](#)
- Russian: [RUSS 101](#), [RUSS 102](#)
- Spanish: [SPAN 101](#), [SPAN 102](#), [SPAN 201A](#), [SPAN 201B](#), [SPAN 210](#), [SPAN 290](#), [SPAN 301A](#), [SPAN 301B](#), [SPAN 390](#), [SPAN 395](#), [SPAN 490](#)
- Theatre and Performance: [THPERF 100](#), [THPERF 102/COMMST 102](#), [THPERF 149/DAC 209/COMMST 149](#), [THPERF 220/SPCOM 220](#), [THPERF 221](#), [THPERF 222](#), [THPERF 284](#), [THPERF 301](#), [THPERF 321](#), [THPERF 322](#), [THPERF 326/COMMST 326](#), [THPERF 343](#), [THPERF 361](#), [THPERF 366](#), [THPERF 368](#), [THPERF 379](#), [THPERF 380/BLKST 380](#), [THPERF 389](#), [THPERF 440/COMMST 440](#)

5. Other [for approval]

5.1 Admissions

Summary:

Minor Modification

Update text for clarification and to remove ambiguity

Background & Rationale:

Current wording is outdated as the university no longer offers all the listed pre-university courses; however, these courses may exist with wording to correctly reflect the admission process for such courses. In addition, wording to the admission and advanced standing has been updated for clarity.

Admission

MARK UP

All first-year engineering students enroll in September and spend the first fall term together at the University, after which they are divided into different streams depending on their plan of study. All students have the same total time on campus and in industry regardless of how their particular stream is scheduled. All students complete the last term of their plan of study together prior to graduation.

The following can be found in this Calendar:

- The admission categories, requirements, and procedures for all plans are outlined in the [Admissions section](#).
- Stream information for each Engineering plan is indicated on the [Study/Work Sequence page](#).
- Precise dates for the beginning and end of the various terms are shown in the [Calendar of Events and Academic Deadlines](#).

Admission for Applicants Not Currently Completing Ontario Secondary School

Applicants must provide recent grades in the required Ontario high school courses or their equivalent. Courses taken at Ontario Colleges of Applied Arts and Technology and similar non-university, post-secondary institutions elsewhere are normally not accepted as equivalent to the required high school courses. ~~The University has developed special pre-university mathematics, physics, and chemistry courses which can be taken online as an alternative.~~ **Post-secondary institutions may offer special pre-university mathematics, physics, and chemistry courses which can be taken to establish grades for required high school courses. Alternatively, applicants seeking to establish recent grades in required courses may take high school courses through an approved high school.** To discuss admissibility and appropriate qualifying studies, applicants are advised to contact ~~the director of admissions~~ **an admissions officer** for the Faculty of Engineering in the fall of the year prior to entering first year.

Admission to Advanced Standing

Admission ~~beyond~~ **beyond the** 1A term is limited to applicants who have ~~an academic~~ **academic course work** and work experience ~~background~~ that is considered equivalent to the particular ~~class cohort of students~~ they would join. ~~Due to the co-operative nature of a Faculty of Engineering plan, no student will be admitted above 3A.~~ **Given the unique nature of the direct-entry, cohort-based co-operative programs offered by the Faculty of Engineering, it is rarely possible to admit students beyond the first-year level. When advanced standing is possible, the first term of study will depend upon credits granted to an applicant. Transfer credits will only be granted when an equivalent course has been studied at a Canadian post-secondary institution. If the awarding of a transfer credit would prevent a student from fully participating in other courses of an academic program, a transfer credit will not be granted. Credit for previous work experience may be granted when previous work experience is deemed equivalent to a co-operative work term placement at an approved employer.**

~~Any student admitted to the 3A term will be required to enrol in the winter term, and to complete satisfactorily the final four academic terms, and the final three work terms and work reports.~~

~~Credit for previous work experience can be applied only to those work terms preceding the level of admission and cannot exceed three work terms. Students who are readmitted to an engineering plan are required to clear all previous failures.~~

Admission of Applicants with a Technical Degree

Applicants who already possess an undergraduate degree in a technical area such as engineering, science, or mathematics will normally be considered for admission into an undergraduate engineering plan only if space remains after all other qualified applicants have been considered. Postgraduate or graduate studies may be more appropriate for these applicants.

Admission

CLEAN COPY

All first-year engineering students enroll in September and spend the first fall term together at the University, after which they are divided into different streams depending on their plan of study. All students have the same total time on campus and in industry regardless of how their particular stream is scheduled. All students complete the last term of their plan of study together prior to graduation.

The following can be found in this Calendar:

- The admission categories, requirements, and procedures for all plans are outlined in the [Admissions section](#).
- Stream information for each Engineering plan is indicated on the [Study/Work Sequence page](#).
- Precise dates for the beginning and end of the various terms are shown in the [Calendar of Events and Academic Deadlines](#).

Admission for Applicants Not Currently Completing Ontario Secondary School

Applicants must provide recent grades in the required Ontario high school courses or their equivalent. Courses taken at Ontario Colleges of Applied Arts and Technology and similar non-university, post-secondary institutions elsewhere are normally not accepted as equivalent to the required high school courses. Post-secondary institutions may offer special pre-university mathematics, physics, and chemistry courses which can be taken to establish grades for required high school courses. Alternatively, applicants seeking to establish recent grades in required courses may take high school courses through an approved high school. To discuss admissibility and appropriate qualifying studies, applicants are advised to contact an admissions officer for the Faculty of Engineering in the fall of the year prior to entering first year.

Admission to Advanced Standing

Admission beyond the 1A term is limited to applicants who have academic course work and work experience that is considered equivalent to the particular cohort of students they would join. Given the unique nature of the direct-entry, cohort-based co-operative programs offered by the Faculty of Engineering, it is rarely possible to admit students beyond the first year level. When advanced standing is possible, the first term of study will depend upon credits granted to an applicant. Transfer credits will only be granted when an equivalent course has been studied at a Canadian post-secondary institution. If the awarding of a transfer credit would prevent a student from fully participating in other courses of an academic program, a transfer credit will not be granted. Credit for previous work experience may be granted when previous work experience is deemed equivalent

to a co-operative work term placement at an approved employer.

Admission of Applicants with a Technical Degree

Applicants who already possess an undergraduate degree in a technical area such as engineering, science, or mathematics will normally be considered for admission into an undergraduate engineering plan only if space remains after all other qualified applicants have been considered. Postgraduate or graduate studies may be more appropriate for these applicants.

5.2 Temporary Calendar Deviations due to the Pandemic [for information]

Background:

The following tables summarize all temporary Calendar deviations that programs made in S2022 to deal with conditions caused by the COVID-19 pandemic. The Faculty and University want an official record of the changes that are significant enough that they impact what is written in the calendar.

S2022 FINAL LIST OF CALENDAR DEVIATIONS AFFECTING PROGRAMS IN FACULTY OF ENGINEERING

Plan	S2022 Calendar Deviations
Architectural Engineering	No deviations
Architecture	No deviations
Biomedical Engineering	No deviations
Chemical Engineering	No deviations
Civil Engineering	No deviations
Electrical Engineering and Computer Engineering	Students following the 2018/2019 calendar were allowed to submit work term reflections in place of technical work term reports.
Environmental Engineering	No deviations
Geological Engineering	No deviations
Management Engineering	No deviations
Mechanical Engineering	No deviations
Mechatronics Engineering	No deviations
Nanotechnology Engineering	NE250: Students may submit a reflective report (graded on a CR/NCR basis) instead of a technical report.
Software Engineering	No deviations
Systems Design Engineering	SYDE351: The topic "Graph theoretic approaches" was omitted in the S2022 offering of this course that was taught to Mechatronics students.

5.3 Appendix: Calendar Descriptions [for information]

Calendar descriptions of the courses proposed to be added to the CSE lists

CO480 to List C

CO 480	(0.50)	LEC	History of Mathematics
An in-depth examination of the origins of mathematics, beginning with examples of Babylonian mathematics. Topics may include Pythagorean triples, solution of equations, estimation of pi, duplication of the cube, trisection of an angle, the Fibonacci sequence, the origins of calculus. [Note: Offered in the spring term of odd years.]			
No Special Consent Required			
Requisites :		Prereq: MATH 135 or 145, 106 or 136 or 146, 138 or 148; Level at least 3A	
Effective 01-SEP-2023			
Requisite Change :		Prereq: One of ECE 108 , MATH 135, or MATH 145; One of MATH 106, 114 , 115 , 136, or 146; MATH 118 , 119 , 128 , 138, or 148; Level at least 3A.	
Rationale :		Add ECE 108, MATH 114 or 115, Math 118 or 119 or 128 to the prereq list. These changes would make it easier for non-math students to take CO 480.	

GER130 to List C

GER 130	(0.50)	LEC	Norse Mythology
This course introduces students to the medieval myths and legends of the Norse peoples using original sources. It explores Norse mythology in the context of historical and archaeological evidence and reflects on the purposes served by contemporary adaptations such as the television series "Vikings: Valhalla" or the "Thor" movies, which are ubiquitous in popular culture, but bear little resemblance to the myths they purport to represent. Through close reading/viewing, writing, and discussions, the course builds historical, cross-cultural, and literary competencies. [Note: Taught in English.]			
Course Attributes:		Also offered Online	

HHUM101 to List C

HHUM 101	(0.50)	LEC	Foundations of Health Humanities
Students will learn how diverse humanities disciplines (literature, history, philosophy, and others) contribute to a rich and well-rounded understanding of human health. Through a study of selected moments, concepts, and texts, students will engage with significant representations of health, illness, medicine, and the body from different eras and cultures. Students will have the opportunity to exercise self-awareness and sensitivity to the experience of others and to form skills in text-centred analysis, critical reflection, and careful argumentation.			

HHUM221 to List C

HHUM 221 (0.50) LEC Monstrous Hunger
In this course students will explore the role eating plays in emotional and physical well-being. Through close reading of literary texts and other textual objects, students will build an understanding of eating as a biological necessity that requires the confrontation of one's relationships with others, the environment, and one's own body and health. Furthermore, in gaining an ability to use the concepts of eating/food studies, students will not only consider how eating is an encounter with one's bodily vulnerabilities and dependencies but also ask how acts of and attitudes towards eating can become monstrous.

HHUM222 to List C

HHUM 222 (0.50) SEM Health, Illness, and Narrative
What stories do we tell ourselves about our bodies, relationships, and lives as we try - individually and as a culture - to be "healthy"? And how do stories help us cope with the uncertain, often scary, and sometimes tragic scenarios when illness replaces health? In this course students will pursue these questions by exploring the role narrative plays in our broader perceptions of health and illness. Through discussion and writing, students will analyze a range of media and genres to gain insight into the larger cultural discourses and social institutions that shape our understanding of these topics.

HHUM307 to List C

HHUM 307 (0.50) LEC Concepts of Health and Disease in Western Medical History
This course introduces students to three paradigms in Western medical history, characterized by the primary clinical locations at which they were practiced: bedside medicine (a holistic approach), hospital medicine (a localized approach), and laboratory medicine (a lab-based approach). Students will engage in close readings of primary and secondary sources to explore how and why certain diseases, like cancer and tuberculosis, were understood differently within these three paradigms. They will learn to engage in an interdisciplinary dialogue by applying humanities-based methodologies and vocabularies to the study of health and disease, from antiquity through to the modern period.

HHUM311 to List C

HHUM 311 (0.50) LEC Culture, Mental Health, and Wellness

This course investigates the objective and subjective realms of mental well-being, ill-being, and illness across diverse societies and cultures, as expressed through literature, film, and other media. Students will investigate the theories and methodologies employed in humanities-based mental health research; understand bibliotherapy both developmentally and therapeutically; and evaluate how texts, images, and performances shape different perspectives of mental illness and mental health. To enhance awareness of subjective aspects of human nature and prejudices, and to appreciate arts-based mental health research, students will engage in experiential learning with a rich-pictures exercise and reflective practice.

HHUM312 to List C

HHUM 312 (0.50) LEC Cross-Cultural Care Traditions

This course will examine the close relationship between cultural plurality and health. Students will explore how attitudes toward health and understandings of illness are influenced and understood by different cultures. Although the course will be grounded in literary texts, it will be supplemented by material from a range of other disciplines. Students will engage issues as varied as the ethics of caring for and being cared by culturally diverse people, non-Western forms of care including Indigenous care, differing perceptions and rules for living (and dying), different attitudes toward medical treatment, and diverse spiritualities. Selected cultural traditions will be studied.

HHUM372 to List C

HHUM 372 (0.50) LEC Women and Medicine in Literature

In this course students will engage with issues related specifically to women in Western medicine. The course will include an historical overview of the position of women in healthcare, but will focus primarily on the 20th and 21st centuries. Students will read a range of primary texts in areas such as fiction, poetry, drama, and life-writing alongside secondary readings that allow them to interrogate the representations and experiences in the primary texts. Through these readings, and through written work and in-class discussion, students will understand and respond to the specific concerns related to women in Western medicine.

HHUM373 to List C

HHUM 373 (0.50) LEC Early Modern Bodies
This course draws on a variety of literary, religious, and medical texts to explore the ways that bodies were understood and represented in early modern England. Students will learn to situate contemporary cultural narratives about bodies, including race, gender, illness, and aging, within a historical context. They will build skills in analyzing the features and functions of narrative and representation, from close reading to thinking about how stories about bodies are shaped, shared, and passed down.

Note: The following courses will also be added to List C (they are not new, just new cross-listings):

- HHUM306/MEDVL306 [MEDVL306 is already on List C]
- HHUM288/RS288 [RS288 is already on List C]
- HHUM218/SMF218 [SMF218 is already on List C]
- HHUM241/SMF241 [SMF241 is already on List C]
- HHUM263/ITALST263 [ITALST263 is already on List C]

DAC201/ENGL203 and ENGL203/DAC201 to List D

Current Catalog Information

DAC 201 (0.50) LEC Designing Digital Images and Interaction

This course draws on multiple theoretical perspectives to introduce students to the fundamental principles of multi-modal communication design in its social context. Students will analyze, design, and produce images and interactivity for use in a variety of digital platforms, including e-learning and business applications.

No Special Consent Required

Requisites : Prereq: Level at least 2A. Antireq: GBDA 101

Cross-listed as: ENGL 203

Effective 01-SEP-2023

Title Change: Designing Digital Media

Description Change: This course draws on multiple theoretical perspectives to introduce students to the fundamental principles of multi-modal communication design in its social context. Students will analyze, design, and produce digital media for use in a variety of platforms.

DAC202/ENGL204 and ENGL204/DAC202 to List D

Current Catalog Information

DAC 202 (0.50) LEC

Designing Digital Video

This course introduces students to the principles of designing time-based multi-modal communication in a social context. Students will analyse, design, and produce video for use in a variety of digital platforms, including e-learning and business applications.

No Special Consent Required

Requisites :

Prereq: Level at least 2A. Antireq: GBDA 201, 202

Cross-listed as:

ENGL 204

Effective 01-SEP-2023

Title Change:

Designing Digital Video

Description Change:

This course introduces students to the principles of designing time-based multi-modal communication in a social context. Students will analyze, design, and produce video for use in a variety of digital platforms.

DAC203/ENGL304 and ENGL304/DAC203 to List D

Current Catalog Information

DAC 203 (0.50) LEC

Designing with Digital Sound

In this course students will be introduced to sound analysis and production. Students will learn to record, edit, and implement sound in a variety of linear and non-linear media forms, with emphasis on film and video games.

No Special Consent Required

Requisites :

Prereq: Level at least 2A. Antireq: DAC 301

Cross-listed as:

ENGL 304

Effective 01-SEP-2023

Title Change:

Designing Digital Sound

Description Change:

In this course students will be introduced to sound production and analysis. Students will learn to record, edit, and implement sound in a variety of genres and formats, with possible areas of investigation including podcasting, documentary, digital games, music, and audio art.

DAC204 to List D

DAC 204 LEC 0.50

Course ID: 015490

Introduction to Game Design

This course explores the fundamentals of game design. It focuses on the essentials shared by all games that are fundamental for a game designer working in any medium, from sports to board games to computer and video games. Although the focus of the course is on designing, prototyping, and testing non-digital games, digital games will be discussed in class to provide students with a broad theoretical and conceptual understanding of the field of game design and development along with practical exercises to train for creating a game.

Prereq: Level at least 2A.

Antireq: DAC 300/ENGL 303/SPCOM 300 taken fall 2016

DAC302 to List D

Current Catalog Information

DAC 302 (0.50) LEC Digital Storytelling

This course teaches students the principles and practices of telling stories using digital technologies to produce short narratives in audio and/or visual formats. Students will learn to develop and present story ideas, create storyboards, write short scripts, and then render their narratives using a variety of digital techniques and tools. [Note: No programming skills are required for this course.]

No Special Consent Required

Requisites : Prereq: At least 1.0 unit in DAC

Effective 01-SEP-2023

Title Change: Digital Storytelling Design

Requisite Change : Prereq: At least 0.50 unit in DAC

DAC303 to List D

Current Catalog Information

DAC 303 (0.50) LEC Advanced Sound for Digital Media

This course advances the skills developed in DAC 203. Students will learn to analyse and produce sound for screen-based media, including film and video games.

No Special Consent Required

Requisites : Prereq: DAC 203

Effective 01-SEP-2023

Title Change: Advanced Topics in Designing Digital Sound

Description Change: This course advances the skills developed in the foundational designing with digital sound course. Students will learn to analyze and produce sound within a particular tradition or cultural field, such as radio drama, documentary, digital games, or film.

Requisite Change : Prereq: At least 0.50 unit in DAC

DAC305 to List D

Current Catalog Information

DAC 305 (0.50) LEC Design and User Experience of Interactive Games

This course introduces fundamental design skills for two-dimensional interactive video games and provides the theoretical knowledge of the emotional and cognitive effects of video game play. Students will understand the importance of user experience assessment for video games as part of iterative design and development. Students will learn to theorize, design, prototype, and test digital games with a special focus on exploring the impact that video games have on human experience. No Special Consent Required

Requisites : Prereq: At least 1.0 unit in DAC

Effective 01-SEP-2023

Title Change: Designing and Evaluating Digital Games

Requisite Change : Prereq: At least 0.50 unit in DAC

DAC307 to List D

Current Catalog Information

DAC 307 (0.50) LEC Digital Display Systems

This course focuses on the creative, technical, and artistic challenges inherent to creating visual content (film, photos, graphics) for the increasingly ubiquitous out-of-home digital displays. The size, configuration, placement, and functions of these public digital displays require new artistic and technical techniques to fully exploit their capabilities. In the course students will explore the design affordances of several types of public digital display as well as produce dynamic, interactive content for them.

No Special Consent Required

Requisites : Prereq: At least 1.0 unit in DAC

Effective 01-SEP-2023

Title Change: Designing Screen-Based Media

Description Change: This course focuses on the creative, technical, and artistic potential of screen-based media and projection art for both public and online digital spaces. In the course students will explore the design affordances of different types of screen and projection media. Students will create projects that produce dynamic, interactive content for public audiences.

Requisite Change : Prereq: At least 0.50 unit in DAC

DAC308 to List D

Current Catalog Information

DAC 308 (0.50) LEC Cinematic Art and Practice

This course explores cinematic representation from an audio-visual production perspective. Students will learn an explicit and replicable theoretical vocabulary for analyzing cinematic technique, as well as engage in practice by creating videographic essays that analyze, interrogate, and extend forms of cinematic representation. Students will engage in production workshops and have access to video and audio editing software. [Note: No prior experience of audio, film, or video production is required.]

No Special Consent Required

Requisites :

Prereq: At least 1.0 unit in DAC

Effective 01-SEP-2023

Description Change:

This course explores cinematic representation from an audio-visual production perspective. Students will learn different approaches to analyzing cinematic technique in a variety of contexts and genres. As a production-oriented course students will create videographic essays or other formal film project in order to analyze, interrogate, and extend forms of cinematic representation. [Note: No prior experience of audio, film, or video production is required.]

Requisite Change :

Prereq: At least 0.50 unit in DAC

DAC309 to List D

Current Catalog Information

DAC 309 (0.50) LEC User Experience Design

This course introduces students to the theory and practice of user experience design as it applies to the design of interactive digital media. Topics will include

user-centred design, personas, iterative testing, prototyping, information gathering interviews, and contextual inquiry.

No Special Consent Required

Requisites :

Prereq: At least 1.0 unit in DAC. Antireq: GBDA 210

Effective 01-SEP-2023

Requisite Change :

Prereq: At least 0.50 unit in DAC. Antireq: GBDA 210

DAC329/COMMST329 and COMMST329/DAC329 to List D

Current Catalog Information

DAC 329 (0.50) LEC Digital Presentations

In this course students will be introduced to design and production of digital business presentations. They will develop specialized digital materials and contribute work to their digital portfolio.

No Special Consent Required

Requisites : Prereq: At least 1.0 unit in DAC

Cross-listed as: SPCOM 329

Effective 01-SEP-2023

Title Change: Designing Digital Presentations

Description Change: In this course students will be introduced to design and production of digital presentations. They will develop specialized digital materials and contribute work to their digital portfolio.

Requisite Change : Prereq: At least 0.50 unit in DAC

ERS200 to List C

ERS 200 (0.50) LEC, TUT Indigenous Sustainability Entrepreneurship

An overview and introduction to environmental sustainability is provided through the lens of Indigenous entrepreneurship. Through a series of case studies students will be introduced to Indigenous sustainability entrepreneurs addressing pressing environmental challenges for Indigenous Peoples and communities. Ultimately, students will be charged with identifying an environmental challenge facing an Indigenous community and developing a business innovation that is a cultural match to protect the planet and future generations.

Requisites : Antireq: ERS 275 001 W23, ERS 275 001 W21

ERS265 to List C

ERS 265 (0.50) LEC, TUT Water: Environmental History and Change

This course explores issues of water management from ancient to recent history. Tensions related to water supply and demand, agriculture and urbanization, health and

sanitation, gender and household access to water resources, urban water and wastewater infrastructure, trans-boundary politics, and water privatization debates are considered. Readings and detailed assessments of national and international cases from Europe, Western Asia, and North America are used as a basis for in-class discussion and research projects.

No Special Consent Required

Requisites :

Prereq: Level at least 2A Environment, Resources and Sustainability students only.

Effective 01-SEP-2023

Requisite Change :

Prereq: Level at least 2A.

GEOG414 to List C

GEOG 414 (0.50) LEC Climate Justice

An exploration of the implications of climate change through a human rights lens and of related questions about who is responsible for climate change; how the burdens of mitigation, adaptation, and compensation should be distributed; and how to evaluate climate policies, programs, and technologies.

Requisites :

Prereq: GEOG 207; Level at least 3A. Antireq: GEOG 474 002 W22

9 May 2023

SENATE UNDERGRADUATE COUNCIL

Submission by the Faculty of Mathematics

1. Course Changes
 - .1. New courses: CS 453, CS 459
 - .2. Course inactivation: CS 458
 - .3. Course changes: CS 100, CS 341
2. Academic Plan Changes (minor modifications)
 - 2.1. Combinatorics and Optimization Joint Honours
 - 2.2. Human Computer Interaction Specialization
 - 2.3. Software Engineering Specialization
 - 2.4. BMATH Data Science Plan
 - 2.5. Joint Pure Mathematics
 - 2.6. Finance Specialization
 - 2.7. Business Administration and Mathematics Double Degree
 - 2.8. Mathematics/Information Technology Management
 - 2.9. Mathematics/Business Administration

NEW COURSES (for approval)

Computer Science - David R. Cheriton School of

Effective 01-SEP-2024

CS 453 (0.50) LAB, LEC, TST Software and Systems Security

Introduction to security issues in modern software, operating systems, and other computing platforms (e.g., mobile and cloud environments). Causes of security breaches and methods to help detect, isolate, and prevent them. Specific topics include comparing security and privacy, program security, operating system security, mobile security, hardware security, administrating security, and legal and ethical issues.

Requisites : Prereq: CS 350 or SE 350; Computer Science students only.

Rationale : This course, along with CS 459, is the replacement of CS 458. The legacy antirequisite of ECE 458 for CS 458 is no longer relevant as the overlap of ECE 458 with CS 453 is not as big. The potential of having CS 458 as anti-requisite was considered and decided against. The overlap is about 50%. Short title: Software & Systems Security

Effective 01-SEP-2024

CS 459 (0.50) LAB, LEC, TST Privacy, Cryptography, Network and Data Security

Introduction to privacy and security using cryptography and related techniques in networks, distributed systems, and data science. The course examines how data and metadata can be protected at rest, in transit, and during computation. For at-rest protection, specific topics include the basics of cryptography and relevant ethics/policy concepts. For in-transit protection, specific topics include network defenses, authentication, and secure and anonymous communication protocols. For during-computation protection, specific topics include data inference, differential privacy, homomorphic encryption, multi-party computations, and related protocols.

Requisites : Prereq: MATH 135 or MATH 145; CS 350 or SE 350. Computer Science students only.

Coreq: CS 454 or CS 456

Rationale : This course, along with CS 453, is the replacement of CS 458. The legacy antirequisite of ECE 458 for CS 458 is no longer relevant as the overlap of ECE 458 with CS 459 is not as big. The potential of having CS 458 as anti-requisite was considered and decided against. The overlap is about 50%. CS 459 depends on at least a basic understanding of computer networks.

Both CS 454 and CS 456 cover computer networks (in much more depth than needed for CS 459, which is why they can be corequisites rather than prerequisites). Short Title: Privacy, Crypto & Security

COURSE CHANGES (for approval)

Current Catalog Information

CS 100 (0.50) LEC Introduction to Computing Through Applications

Using personal computers as effective problem solving tools for the present and the future. Effective use of spreadsheets to process, manipulate, and visualize numeric and textual information. Introduction to the Internet, World Wide Web, HTML, and XML. Algorithms underlying the functional components of web search engines and their influence on data access. Using wikis to publish, reshape, and organize data collaboratively. [Offered: F,W,S]

No Special Consent Required

Requisites :

Prereq: Not open to Mathematics, Biomedical, Chemical, Civil, Computer & Electrical, Environmental, Geological, Management, Mechanical, Mechatronics, Nano technology & Systems Design Eng students. Antireq: All second, third or fourth year CS courses or equivalents

Effective 01-SEP-2024

Component Change:

Rationale :

[LAB](#), [LEC](#), [TST](#), [TUT](#)

In 2009, a decision to only offer CS 100 through distance education was made. The rationale is loss to time. The School wants to now offer it also on campus (so the legacy label "Only offered online" would have been replaced by "Also offered online" were this information still presented in the calendar.). To support this mode of delivery, we add LAB, TST, TUT components for consistency with other CS 100-level courses that are offered in-person. Lab is not necessarily scheduled and, when not scheduled, students are expected to find time in open hours to complete their work.

Current Catalog Information

CS 341 (0.50) LAB, LEC, TST, TUT Algorithms

The study of efficient algorithms and effective algorithm design techniques. Program design with emphasis on pragmatic and mathematical aspects of program efficiency. Topics include divide and conquer algorithms, recurrences, greedy algorithms, dynamic programming, graph search and backtrack, problems without algorithms, NP-completeness and its implications. [Note: Enrolment is restricted; see Note 1 above. Lab is not scheduled and students are expected to find time in open hours to complete their work.]

No Special Consent Required

Requisites :

Prereq: CS 240/240E and (MATH 239 or 249); Computer Science and BMath (Data Science) students only. Antireq: CS 231, ECE 406

Effective 01-SEP-2024

Requisite Change :

Prereq: CS 240 or CS 240E; [One of CS 245, CS 245E, SE 212](#); MATH 239 or MATH

Rationale : 249; One of STAT 206, STAT 230, STAT 240; Computer Science and BMath (Data Science) students only.
Antireq: CS 231, ECE 406
CS 341 covers NP-completeness which requires knowledge of propositional logic, which is covered in CS 245/245E or SE 212. CS 341 has CS 240/240E as a prerequisite, which transitively has CS 245/245E or SE 212 as a prerequisite. However, students can use CS 240E as an alternative for CS 240, and CS 240E does not have the transitive dependency on CS 245/245E or SE 212. To close this loophole, we should add the prerequisite explicitly. Similarly, CS 341 also depends on probability, so we wish to make explicit the prerequisite of STAT 206 or STAT 230 or STAT 240.

COURSE INACTIVATIONS (for approval)

Effective 01-SEP-2024
CS 458 (0.50)
Rationale :

Computer Security and Privacy
To be current with the field, more material needs to be added to this course but then the course is too big. So the course is deactivated and two new courses are created. This course is explicitly listed in two specializations (modified accordingly in this SUC package) and the Software Engineering (SE) plan. The SE curriculum committee is aware of this change, and proposed appropriate modifications to the program, approved by now by Math Faculty Council and still going through curricular approval in Engineering.

End of Report

2. Academic Plan Changes (minor modifications)

2.1 Combinatorics and Optimization Joint Honours

Effective 1 September 2024, add CS 487 Introduction to Symbolic Computation to the last “Three of” list for the Joint Combinatorics and Optimization plan requirements. This is because CS 487 is already allowed for the CO major.

(<https://ugradcalendar.uwaterloo.ca/page/MATH-Joint-Combinatorics-and-Optimization1>)

[...]

- Three of
 - [AMATH 331/PMATH 331](#) Applied Real Analysis or [PMATH 333](#) Introduction to Real Analysis
 - [AMATH 332/PMATH 332](#) Applied Complex Analysis
 - [CS 341](#) Algorithms
 - [CS 360](#) Introduction to the Theory of Computing
 - [CS 466](#) Algorithm Design and Analysis
 - [CS 487](#) Introduction to Symbolic Computation
 - [MATH 237](#) Calculus 3 for Honours Mathematics or [MATH 247](#) Calculus 3 (Advanced Level)
 - [PMATH 334](#) Introduction to Rings and Fields with Applications or [PMATH 348](#) Fields and Galois Theory
 - [PMATH 340](#) Elementary Number Theory

2.2 Human Computer Interaction Specialization

2.3 Software Engineering Specialization

Effective 1 September 2024, add the choice of either **CS 453 Software and Systems Security** or **CS 459 Privacy, Cryptography, Network and Data Security** to “Two of” lists of 400-level courses in the **Human-Computer Interaction Specialization** and in the **Software Engineering Specialization**. Both CS 453 and CS 459 are new courses extending and replacing CS 458.

Human-Computer Interaction Specialization

(<https://ugradcalendar.uwaterloo.ca/page/MATH-Computer-Sci-Human-Computer-Interaction-Spec>)

The HCI Specialization is available for [Bachelor of Computer Science \(BCS\)](#), [Bachelor of Mathematics \(Computer Science\) \(BMath\)](#), and [Bachelor of Software Engineering \(BSE\)](#) academic plans. The course requirements are the same as for the BCS, BMath (CS), and BSE academic plans with the following additional requirements:

- All of
 - [CS 349](#) User Interfaces
 - [CS 449](#) Human-Computer Interaction
 - [CS 492](#) The Social Implications of Computing
- Two of
 - [CS 445/ECE 451](#) or [SE 463](#) Software Requirements Specification and Analysis
 - [CS 446/ECE 452](#) or [SE 464](#) Software Design and Architectures
 - [CS 447/ECE 453](#) Software Testing, Quality Assurance, and Maintenance or [SE 465](#) Software Testing and Quality Assurance
 - [CS 453 Software and Systems Security](#) or [CS 459 Privacy, Cryptography, Network and Data Security](#)
 - [CS 454](#) Distributed Systems
 - ~~[CS 458 Computer Security and Privacy](#)~~
 - [CS 480](#) Introduction to Machine Learning or [CS 485](#) Statistical and Computational Foundations of Machine Learning
 - [CS 484](#) Computational Vision

- CS 488 Introduction to Computer Graphics
- [...]

Software Engineering Specialization

(<https://ugradcalendar.uwaterloo.ca/page/MATH-Computer-Sci-Software-Engineering-Spec>)

[...]

Applications

- Two of
 - CS 343 Concurrent and Parallel Programming
 - CS 348 Introduction to Database Management
 - CS 349 User Interfaces
- Two of
 - CS 442 Principles of Programming Languages
 - CS 444 Compiler Construction
 - CS 448 Database Systems Implementation
 - CS 449 Human-Computer Interaction
 - CS 450 Computer Architecture
 - CS 451 Intensive Distributed Computing
 - CS 452 Real-time Programming
 - CS 453 Software and Systems Security or CS 459 Privacy, Cryptography, Network and Data Security
 - CS 454 Distributed Systems
 - CS 456 Computer Networks
 - CS 457 System Performance Evaluation
 - ~~CS 458~~ ~~Computer Security and Privacy~~
 - CS 480 Introduction to Machine Learning
 - CS 484 Computational Vision
 - CS 486 Introduction to Artificial Intelligence
 - CS 488 Introduction to Computer Graphics

2.4 BMATH Data Science Plan

Effective 1 September 2024, incorporate the Data Science plan requirements and Statistics plan requirements into the BMath Data Science (DS) plan requirements. The BMath Data Science plan is a hard plan for students to interpret in the calendar because it requires students to check requirements on two separate pages (DS plan and STAT plan). Combining the two lists of requirements together would make it easier for students to follow and understand what is required. In making this change a few adjustments were made to clarify some points on which there has been confusion in the past:

- Removed CS 451 since it is not a course the BMath DS students can take since they do not take CS 350
- Removed the CS courses from the “Two of list” as students have to take at least 2 400-level STAT courses (in STAT plan) and students were often missing this requirement when taking one of the CS courses. This change will avoid these common errors.
- CS 484 has been added as a possible course. CS plans to add this course to the BCS – Data Science requirements and will update prereqs to this course to allow BMATH DS students into the course. The CS Undergraduate Director has also reviewed and has no concerns with the proposed BMath DS plan changes.
- Notes indicating (un-)acceptable substitutions have been copied from the STAT plan. Discussions are in progress as to the future of those notes, but they are currently active components of the plan requirements.

Context: Comparison of current Statistics plan requirements, Data Science additional requirements and proposed Data Science plan requirements.

	Statistics Plan	Data Science additions	Proposed Data Science plan
Total math courses	26	28.5 total	28.5
Table 1 and Table 2	Yes (10 math incl 237)		Yes (10 incl 136, 237)
		CS 136/146	CS 136/146
	MATH 237/247		MATH 237/247
	ENGL 378, STAT 330, 331, 332, 333		ENGL 378, STAT 330, 331, 332, 333
	One of: Math 239/249, AMATH 231, 242, 250, 251, 350	Math 239/249	Math 239/249
	Two STAT 4xx	Two of: CS 480, 485, 486, STAT 431, 440, 441, 442, 443, 444	Two of: STAT 431, 440, 441, 442, 443, 444
	One STAT3/4xx	STAT 341	STAT 341
	One of: STAT 4xx or CS 457, 485, 486	One of: CS 480, 485, 486, STAT 441	One of: CS 480, 484, 485, 486, STAT 441
	Four MATH 3/4xx	CS 341, 348, 431/451, *	CS 341, 348, 431, *
	Three additional MATH	CS 240, 241, 245	CS 240, 241, 245
		CS 136L, 246, 251,	CS 136L, 246, 251,
			*One add MATH 3/4xx

Calendar Text: (To replace <https://ugradcalendar.uwaterloo.ca/page/MATH-Data-Science1>)

Additions and deletions as usual, though only those highlighted in yellow are true changes.

The Faculty of Mathematics offers two honours degrees in Data Science, a Bachelor of Mathematics (BMath - Data Science) and a Bachelor of Computer Science (BCS - Data Science). The Data Science academic plans are offered jointly by the Department of Statistics and Actuarial Science and by the David R. Cheriton School of Computer Science.

~~This academic plan has the same requirements as Honours Statistics with the following additional requirements:~~

Students in this academic plan must fulfil all the requirements in [Table 1](#) and [Table 2](#). This must include at least 28.5 math courses and the following specific requirements:

- One of
 - [CS 136](#) Elementary Algorithm Design and Data Abstraction
 - [CS 146](#) Elementary Algorithm Design and Data Abstraction (Advanced Level)
- One of
 - [MATH 237](#) Calculus 3 for Honours Mathematics
 - [MATH 247](#) Calculus 3 (Advanced Level)
- One of
 - [MATH 239](#) Introduction to Combinatorics
 - [MATH 249](#) Introduction to Combinatorics (Advanced Level)
- All of
 - [CS 136L](#) Tools and Techniques for Software Development
 - [CS 240](#) Data Structures and Data Management or [CS 240E](#) Data Structures and Data Management (Enriched)
 - [CS 241](#) Foundations of Sequential Programs or [CS 241E](#) Foundations of Sequential Programs (Enriched)
 - [CS 245](#) Logic and Computation or [CS 245E](#) Logic and Computation (Enriched)
 - [CS 246](#) Object-Oriented Software Development or [CS 246E](#) Object-Oriented Software Development (Enriched)
 - [CS 251](#) Computer Organization and Design or [CS 251E](#) Computer Organization and Design
 - [CS 341](#) Algorithms
 - [CS 348](#) Introduction to Database Management
- ~~One of~~
 - [CS 431](#) Data-Intensive Distributed Analytics
 - [CS 451](#) Data-Intensive Distributed Computing
 - [ENGL 378/MTHEL 300](#) Professional Communications in Statistics and Actuarial Science
 - [STAT 330](#) Mathematical Statistics
 - [STAT 331](#) Applied Linear Models
 - [STAT 332](#) Sampling and Experimental Design
 - [STAT 333](#) Stochastic Processes 1
 - [STAT 341](#) Computational Statistics and Data Analysis
- One of
 - [CS 480](#) Introduction to Machine Learning
 - [CS 484](#) Computational Vision
 - [CS 485](#) Statistical and Computational Foundations of Machine Learning
 - [CS 486](#) Introduction to Artificial Intelligence
 - [STAT 441](#) Statistical Learning - Classification
- Two additional courses from the following list
 - [CS 480](#) Introduction to Machine Learning
 - [CS 485](#) Statistical and Computational Foundations of Machine Learning

- **CS 486 Introduction to Artificial Intelligence**
 - [STAT 431](#) Generalized Linear Models and their Applications
 - [STAT 440](#) Computational Inference
 - [STAT 441](#) Statistical Learning - Classification
 - [STAT 442](#) Data Visualization
 - [STAT 443](#) Forecasting
 - [STAT 444](#) Statistical Learning - Advanced Regression
 - One additional 300- or 400-level math course (0.5 units) from [ACTSC](#), [AMATH](#), [CO](#), [CS](#), [MATBUS](#), [MATH](#), [PMATH](#), or [STAT](#)
- Notes**
1. For Data Science majors currently or previously enrolled in the following academic plans (Business Administration and Mathematics double degree, Mathematics/Business Administration, Mathematics/Financial Analysis and Risk Management, Information Technology Management, and Mathematical Optimization – Business Specialization) may substitute:
 - [STAT 371](#) for [STAT 331](#).
 - [STAT 372](#) for [STAT 332](#).
 2. For Data Science majors:
 - [STAT 334](#) is not an acceptable substitute for [STAT 330](#) or [STAT 333](#);
 - [STAT 373](#) is not an acceptable substitute for [STAT 331](#).
 3. Business Administration and Mathematics double degree students may substitute BUS 362W for [ENGL 378/MTHEL 300](#).

2.5 Joint Pure Mathematics

Effective 1 September 2024, add 2 “One of” lists, one with PMATH 334 Introduction to Rings and Fields with Applications and PMATH 348 Fields and Galois Theory. The other “One of” list should have PMATH 336 Introduction to Group Theory with Applications and PMATH 347 Groups and Rings. This change would rule out the possibility of using PMATH 336 and PMATH 347 to satisfy two requirements. There is too much overlap in the content of these two courses: more specifically, essentially all of the material in PMATH 336 is covered in PMATH 347.

(<http://ugradcalendar.uwaterloo.ca/page/MATH-Joint-Pure-Mathematics1>)

- [...]
- One of
 - [AMATH 332/PMATH 332](#) Applied Complex Analysis
 - [PMATH 352](#) Complex Analysis
 - One of
 - [PMATH 334](#) Introduction to Rings and Fields with Applications
 - [PMATH 348](#) Fields and Galois Theory
 - One of
 - [PMATH 336](#) Introduction to Group Theory with Applications
 - [PMATH 347](#) Groups and Rings
 - One of
 - [MATH 239](#) Introduction to Combinatorics
 - [MATH 249](#) Introduction to Combinatorics (Advanced Level)
 - An additional [PMATH](#) course
 - ~~Two of~~
 - ~~[PMATH 334](#) Introduction to Rings and Fields with Applications~~
 - ~~[PMATH 336](#) Introduction to Group Theory with Applications~~

- ~~PMATH 347 Groups and Rings~~
- ~~PMATH 348 Fields and Galois Theory~~
- Three additional PMATH courses

2.6 Actuarial Science Finance Specialization

Effective September 2024, adding **ACTSC 423/AFM 423 Topics in Financial Econometrics** to the first “One of” list in the Finance specialization under Honours Actuarial Science. ACTSC 423/AFM 423 has as much finance content as the other two courses on the list. The course content is deemed to be very relevant to the finance specialization. The regular instructor is jointly appointed between SAF and SAS, and should this instructor not be available the two units would be jointly responsible for appointing a replacement. The course is already promoted to the actuarial sciences students and only approximately 10 actuarial sciences majors graduate every year with the finance specialization, so the impact on enrollment is expected to be minimal. SAF was consulted on this change.

(<https://ugradcalendar.uwaterloo.ca/page/MATH-AS-Finance-Specialization>)

This academic plan has the same requirements as Honours Actuarial Science with the following additional requirements:

- One of
 - [ACTSC 423/AFM 423 Topics in Financial Econometrics](#)
 - [AFM 424](#) Equity Investments
 - [ACTSC 471/AFM 476](#) Advanced Corporate Finance
- One of
 - [AMATH 242/CS 371](#) Introduction to Computational Mathematics
 - [CS 370](#) Numerical Computation
- All of
 - [AFM 102](#) Introduction to Managerial Accounting
 - [ACTSC 445](#) Quantitative Enterprise Risk Management
 - [CS 476](#) Numeric Computation for Financial Mo

[...]

2.7 Business Administration and Mathematics Double Degree

Effective September 2024, a number of changes to the Business Administration and Mathematics Double Degree are needed due to changes made by the Wilfried Laurier University (WLU) Lazaridis School of Business and Economics:

- BUS 352W is renumbered BUS 252W
- BUS 362W is renamed Applied Marketing
- BUS 481W is renumbered BUS 381W

Furthermore, the requirement for one of ECON 250W or ECON 260W is removed, and an additional BUS or ENTR elective is required. WLU’s rationale for removing EC 250 (ECON 250W) or EC 260 (ECON 260W) is driven by the areas and based on student feedback. The only area that requires the content of these courses is Finance which has included the courses in its list of required electives. Students surveyed as part of the cyclical review, identified these two courses as the least valuable of all their courses. In its place, we will have a business elective which a student can use to broaden their horizon to take courses that could be

geared towards their interests including courses on negotiation, conflict resolution. The changes were approved by the Math/Business Group.

The number of required units is unchanged.

(<https://ugradcalendar.uwaterloo.ca/page/MATH-Bus-Admin-and-Math-Double-Degree-Requirements>)

[...]

From Wilfrid Laurier University (Laurier)

- All of
 - BUS 111W Understanding the Business Environment
 - BUS 121W Functional Areas of the Organization
 - BUS 127W Introduction to Financial Accounting
 - BUS 231W Business Law
 - BUS 247W Managerial Accounting
 - [BUS 252W Introduction to Marketing Management](#)
 - BUS 283W Financial Management I
 - BUS 288W Organizational Behaviour I
 - ~~BUS 352W Introduction to Marketing Management~~
 - BUS 354W Human Resources Management
 - BUS 362W ~~Building and Managing Products, Services and Brands~~ [Applied Marketing](#)
 - BUS 375W Operations Management
 - [BUS 381W Business Policy I](#)
 - BUS 393W Financial Management II
 - BUS 398W Organizational Behaviour II
 - ~~BUS 481W Business Policy I~~
 - BUS 491W Business Policy II
 - ECON 120W Introduction to Microeconomics
 - ECON 140W Introduction to Macroeconomics
- ~~One of~~
 - ~~ECON 250W Intermediate Macroeconomic Analysis for Management~~
 - ~~ECON 260W Intermediate Microeconomic Analysis for Management~~
- ~~Seven~~ ~~Six~~ additional 300- or 400-level BUS or ENTR elective courses (~~3.5~~ ~~3.0~~ units) taken in third, fourth, or fifth year.

From Waterloo or Laurier

Four additional elective courses (2.0 units) are required. Students are free to choose their elective courses from either university.

2.8 Mathematics/Information Technology Management

Motion: Effective September 2024, a few changes to the Mathematics/Business Information Technology Management are needed due to changes made by the Wilfried Laurier University (WLU) Lazaridis School of Business and Economics:

- BUS 352W is renumbered BUS 252W
- BUS 481W is renumbered BUS 381W

(<https://ugradcalendar.uwaterloo.ca/page/MATH-Information-Techn-Mgt-Degree-Requirements>)

[...]

- All of
 - [AFM 101](#) Introduction to Financial Accounting
 - [AFM 102](#) Introduction to Managerial Accounting

- BUS 111W Understanding the Business Environment
- BUS 121W Functional Areas of the Organization
- BUS 252W Introduction to Marketing Management ~~BUS 352W Introduction to Marketing Management~~ or MGMT 244/ARBUS 302 Principles of Marketing
- BUS 381W Business Policy I ~~BUS 481W Business Policy I~~
- COMM 431 Project Management
- COMM 432 Electronic Business
- CS 230 Introduction to Computers and Computer Systems
- CS 330 Management Information Systems
- CS 338 Computer Applications in Business: Databases
- CS 430 Applications Software Engineering
- CS 436 Networks and Distributed Computer Systems
- ECON 101 Introduction to Microeconomics
- ECON 102 Introduction to Macroeconomics
- MSCI 211 Organizational Behaviour
- MSCI 311 Organizational Design and Technology
- STAT 371 Applied Linear Models and Process Improvement for Business
- STAT 372 Survey Sampling and Experimental Design Techniques for Business
- STV 202 Design and Society
- One additional 300- or 400-level STV course (0.5 unit)
- One additional 300- or 400-level math course (0.5 unit) from ACTSC, AMATH, CO, CS, MATBUS, MATH, PMATH, or STAT
- Three additional courses (1.5 units)

2.9 Mathematics/Business Administration

Motion: Effective September 2024, several changes to the Mathematics/Business Administration are needed due to changes made by the Wilfried Laurier University (WLU) Lazaridis School of Business and Economics:

- BUS 352W is renumbered BUS 252W
- BUS 481W is renumbered BUS 381W

(<https://ugradcalendar.uwaterloo.ca/page/MATH-Mathematics-or-Bus-Admin-Degree-Requirements>)

[...]

- All of
 - AFM 102 Introduction to Managerial Accounting
 - BUS 111W Understanding the Business Environment
 - BUS 121W Functional Areas of the Organization
 - BUS 252W Introduction to Marketing Management ~~BUS 352W Introduction to Marketing Management~~ or MGMT 244/ARBUS 302 Principles of Marketing
 - BUS 381W Business Policy I ~~BUS 481W Business Policy I~~
 - CO 370 Deterministic OR Models
 - CS 330 Management Information Systems
 - CS 338 Computer Applications in Business: Databases
 - ECON 101 Introduction to Microeconomics
 - ECON 102 Introduction to Macroeconomics
 - HRM 200 Basic Human Resources Management
 - MATBUS 371 Introduction to Corporate Finance
 - STAT 371 Applied Linear Models and Process Improvement for Business
 - STAT 372 Survey Sampling and Experimental Design Techniques for Business

- Three additional math courses (1.5 units) from ACTSC, AMATH, CO, CS, MATBUS, MATH, PMATH, or STAT

[...]

**RENISON UNIVERSITY COLLEGE REPORT TO SENATE UNDERGRADUATE COUNCIL (SUC)
May 9, 2023**

CONTENT

1. NEW COURSES

- 1.1. EMLS 191– Communication in the Engineering Profession (AE, CIVE, GEOE)
- 1.2. EMLS 192- Communication in the Engineering Profession (COMP, ELE, MGTE)

NEW COURSES (for approval)

Renison University College

Effective 01-SEP-2024

EMLS 191 (0.50) LEC Communication in the Engineering Profession (AE, CIVE, ENVE, GEOE)

Designed for students in Architectural, Civil, Environmental, and Geological Engineering whose dominant language is not English, this course will enhance students' oral and written communication competencies in contexts relevant to the engineering profession.

Requisites : Prereq: Architectural, Civil, Environmental, and Geological Engineering students. Antireq: GENE 199, topic "Comm. in the Eng'g Profession"; ENGL 191/COMMST 191

Rationale : This course is proposed at the request of Engineering and the Undergraduate Communication Requirements Group (UCRG) to provide a course within the Engineering undergraduate communication skills initiative designed specifically for students whose dominant language is not English. This proposal is supported by the Faculty of Engineering, and the Director of the Undergraduate Communications Requirement Group, with support from the Departments of English and Communication Studies. The usual Renison "R" at the end of the course number has not been included to more clearly align this course with other courses in Engineering plans. Short title: Eng Comm (AE, CIVE, ENVE, GEOE)

Effective 01-SEP-2024

EMLS 192 (0.50) LEC Communication in the Engineering Profession (COMPE, ELE, MGTE)

Designed for students in Computer, Electrical, and Management Engineering whose dominant language is not English, this course will enhance students' oral and written communication competencies in contexts relevant to the engineering profession.

Requisites : Prereq: Computer, Electrical, and Management Engineering students. Antireq: GENE 191, ENGL 192/COMMST 192

Rationale : This course is proposed at the request of Engineering and the Undergraduate Communication Requirements Group (UCRG) to provide a course within the Engineering undergraduate communication skills initiative designed specifically for students whose dominant language is not English. This proposal is supported by the Faculty of Engineering, and the Director of the Undergraduate Communications Requirement Group, with support from the Departments of English and Communication Studies. The usual Renison "R" at the end of the course number has not been included to more clearly align this course with other courses in Engineering plans. Short title: Eng Comm (COMPE, ELE, MGTE)

End of Report

May 9, 2023

TO: Tim Weber-Kraljevski, Associate University Secretary, Secretariat

FROM: Jason Grove, Associate Dean, Undergraduate Studies, Faculty of Engineering
Benoit Charbonneau, Associate Dean, Undergraduate Studies, Faculty of Mathematics

SUBJECT: Items for Approval at May 9, 2023 Senate Undergraduate Council

ALL CURRICULUM CHANGES ARE EFFECTIVE SEPTEMBER 2024 UNLESS OTHERWISE NOTED.

1. **Course Changes** *[For Approval]*
 - 1.1 Software Engineering (SE 212, 380, 463)

2. **Academic Plans (Minor Modifications)** *[For Approval]*
 - 2.1. Software Engineering
 - 2.2. Software Engineering Sequence Change

COURSE CHANGES (for approval)

Software Engineering

Current Catalog Information

SE 212 (0.50) LEC, TST, TUT Logic and Computation
Formal logic. Proof systems and styles. Rudimentary model theory. Formal models of computation. Logic-based specification. Correctness proofs. Applications in software engineering. [Offered: F]

No Special Consent Required

Requisites : Prereq: MATH 135; ~~Software Engineering~~

Effective 01-SEP-2024

Requisite Change : Prereq: CS 138 and MATH 135

Antireq: CS245, CS 245E, ECE208, PMATH 330

Rationale : Math has asked engineering to consider a better alignment of the requisites of SE212 with CS245 and ECE208. Because SE212 is the Software Engineering version of CS245 or ECE208, Software Engineering is being removed from the prerequisites.

Current Catalog Information

SE 380 (0.50) LAB, LEC, TUT

Introduction to Feedback Control Introduction to control systems. Advantages of closed-loop feedback systems. The role of the system mathematical model. Block diagrams and signal flow graphs. The basic control system design problem, stability in control systems. Frequency response analysis techniques. Root-locus analysis. Elementary lead-lag compensation. [Offered: F]

No Special Consent Required

Requisites : Prereq: MATH 213; ~~Software Engineering-~~

Antireq: ECE 380, ME 360, MTE 360, SYDE 352

Effective 01-SEP-2024

Requisite Change : Prereq: MATH 213.

Antireq: ECE 380, ME 360, MTE 360, SYDE 352

Rationale : Removing "Software Engineering" so that students from other faculties can take the course

Current Catalog Information

SE 463 (0.50) LAB, LEC, TUT Software Requirements Specification and Analysis

Introduces students to the requirements definition phase of software development; models, notations, and processes for software requirements, identification, representation, analysis, and validation. Cost estimation from early documents and specifications. [Note: Lab is not scheduled and students are expected to find time in open hours to complete their work. Offered: S]

No Special Consent Required

Requisites : Prereq: CS 246 or 247; ~~Software Engineering~~. Antireq: CS 445, ECE 451

Effective 01-SEP-2024

Requisite Change : Prereq: **One of CS 246/246E, 247, ECE 250, MSCI 342, SYDE 322, Computing Option or Software Engineering Option.**
Antireq: CS 445, ECE 451

Rationale : Removing "Software Engineering" and adding the additional courses will allow students from other faculties to take the course. This also allows students from either the computing option or software option background to be successful in the course.

End of Report

2. Academic Plans (Minor Modifications) [for approval]

2.1. Software Engineering

Summary:

1. Minor Modification:

- a) Add a Sustainability Requirement
- b) Add some Natural Science Elective courses
- c) Eliminate footnotes 1-3 and modify the terms
- d) Delete footnotes 4&5 and move to be in-line with main text
- e) Move CHE 102 to 1A
- f) Create Physics Requirement and Move ECE 105 and ECE 106 to Science Elective List.
- g) Defining and adding designation courses that can be deferred/dropped.
- h) Add CS449 (Human-Computer Interaction) and MSCI343 (Human-Computer Interaction) as alternatives to CS349.
- i) Editorial change

2. Course Changes:

- a) Changing prerequisites to SE212 (Logic and Computation), SE380 (Introduction to Feedback Control) & SE463 (Software Requirements Specification and Analysis)

Background & Rationale:

1a) The Canadian Engineering Accreditation Board (CEAB) states that the purpose of accreditation is, in part, to ensure the engineering curriculum covers in concepts of sustainable development; therefore, effective 1 September 2024, Software Engineering students will need to complete a Sustainability Requirement as part of their degree requirement. All units offering courses under the proposed list have been consulted.

b) Addition of courses to the Natural Science Elective list as possible selections to improve flexibility. Courses have been approved by the SE Curriculum Committee.

c) To keep in practice of removing footnotes as recommended by the Calendar Editor, footnotes 1-3 have been removed and term modified to provide students with more elective flexibility.

d) To align with new editorial guidelines, footnotes are recommended to be placed within text. Footnote 4 & 5 have been moved to main text for clarity.

e) Every other program that includes CHE102 has the course taught in 1A; whereas SE has CHE102 in 2A which creates logistical scheduling problems. Moving CHE 102 to 1A will align with other Engineering programs.

f) The Software Curriculum Committee wants to create flexibility for students about when they take physics. To achieve this logistically, there must be some flexibility in which physics courses they are permitted to take and therefore moving ECE 105 and ECE 106 to the Science Elective list. All of the identified physics courses satisfy accreditation requirements.

g) Defining and adding description of (D) within plan for courses that can be deferred/dropped to accommodate reduced-load students.

h) Listing CS449 and MSCI343 as alternative to CS349 (User Interfaces) to create student flexibility. This will not impact accreditation.

i) Remove CHEM 404 from the Natural Science Elective list. As the Faculty of Science has changed the prerequisites of this course and is no longer attainable.

2) Changing SE212 prerequisites to better align with CS245 & ECE208 as requested by Math UAC. Removing the “software engineering” prerequisite from SE380 and SE463 to be accessible to students in other programs.

Software Engineering

MARK UP

The Honours Software Engineering plan leads to a Bachelor of Software Engineering (BSE) degree.

Admissions

The Software Engineering Board, in consultation with the faculties of Engineering and Mathematics and their admissions committees, determines the admission requirements for Software Engineering.

For details on admission information, see the [Admissions section](#) of this Calendar.

Options, Specializations, Minors, and Joint Honours

Software Engineering students are considered as both Mathematics and Engineering students, and can thus take advantage of degree enhancements available to students from either faculty. These enhancements take the form of additional plans such as options, specializations, [minors](#), and joint honours.

Software Engineering students are eligible for either the Artificial Intelligence Option (Engineering) or the Artificial Intelligence Specialization (Computer Science), but cannot graduate with both degree enhancements. See the full list of [Computer Science specializations](#) or the full list of [Options, Specializations and Electives for Engineering Students](#).

The following Mathematics Joint Honours plans are also approved as additional plans for BSE students:

- [Joint Applied Mathematics](#)
- [Joint Combinatorics and Optimization](#)
- [Joint Pure Mathematics](#), and
- [Joint Statistics](#)

BSE students are not eligible to add Joint Computer Science (Bachelor of Mathematics), Joint Bachelor of Computer Science plans, or stand-alone BMath Honours plans from the Faculty of Mathematics. BSE students pursuing a Joint Honours plan are not required to satisfy the Table 2 Faculty Core Courses requirements in the degree requirements for all Mathematics students. These students are still required to fulfil all requirements for the BSE.

BSE students may be eligible to add other options, specializations, or minors in Mathematics, Engineering, or other faculties, subject to the approval of the Software Engineering associate director. Students should be aware that adding plans will constrain their choice of electives, and may require additional courses. Thus, it is advisable to start preparing for additional plans in the first and second years. Students should also consider the benefits of not adding plans, in that they are better able to personalize their curriculum if they have more flexibility in choosing their electives. Students interested in pursuing additional academic

plans, see [invalid credential combinations](#).

Software Engineering Awards

Students in the Bachelor of Software Engineering plan are eligible for Awards of Excellence in the Faculty of Mathematics. Students in the Bachelor of Software Engineering plan are eligible for Awards of Excellence in the Faculty of Engineering.

Honours Software Engineering

The Software Engineering plan is offered jointly by the David R. Cheriton School of Computer Science and the Department of Electrical and Computer Engineering; **it is offered primarily in the co-operative 8-stream. Students may choose to switch to the 8X-stream after 3B with advisor approval.**

Students will be considered members of both the Faculty of Engineering and the Faculty of Mathematics, although for administrative purposes they will be registered officially in a separate unit. Students will be promoted based on the [Examinations and Promotions](#) rules used in the Faculty of Engineering. ~~A non-voting representative from the Faculty of Mathematics will sit on the Engineering Examinations and Promotion Committee, to provide insight into the policies, philosophies, culture, and requirements that pertain to Mathematics students.~~ The Software Engineering plan is also considered an Honours Mathematics plan for purposes of student access to Mathematics courses. The Software Engineering advisor will advise students on how to achieve their academic goals.

Students enrolled in the Software Engineering will only be permitted to use the WD and WF (see Grades for description) provisions used in the Faculty of Mathematics to withdraw from extra courses taken above the degree requirements.

Legend for Study/Work Sequence Table

Key	Description
F,W,S	F=fall term, W=winter term, S=spring term
1,2,3,4 plus A or B	Denotes academic year and term.
WT	Denotes scheduled work terms.

Study/Work Sequence

Sequence	F	W	S	F	W	S	F	W	S	F	W	S	F	W
Stream 8	1A	1B	WT	2A	WT	2B	WT	3A	WT	3B	WT	4A	WT	4B
Stream 8X	1A	1B	WT	2A	WT	2B	WT	3A	WT	3B	WT	WT	4A	4B

Academic Curriculum

The term-by-term academic component of the curriculum is as follows:

Term 1A (Fall)

- [CS 137](#) Programming Principles

- ~~ECE 105 Classical Mechanics~~
- [CHE 102 Chemistry for Engineers \(D\)](#)
- [MATH 115](#) Linear Algebra for Engineering
- [MATH 117](#) Calculus 1 for Engineering
- [MATH 135](#) Algebra for Honours Mathematics
- [SE 101](#) Introduction to Methods of Software Engineering

Term 1B (Winter)

- [CS 138](#) Introduction to Data Abstraction and Implementation
- ~~ECE 106 Electricity and Magnetism~~
- [ECE 124](#) Digital Circuits and Systems
- [ECE 140](#) Linear Circuits **(D)**
- [MATH 119](#) Calculus 2 for Engineering
- [SE 102](#) Seminar
- [Elective](#) *(see Note 1)*

Term 2A (Fall)

- ~~CHE 102 Chemistry for Engineers (see Note 7)~~
- [CS 241](#) Foundations of Sequential Programs
- [ECE 222](#) Digital Computers
- [SE 201](#) Seminar
- [SE 212](#) Logic and Computation
- [STAT 206](#) Statistics for Software Engineering
- ~~Undergraduate Communication Requirement (see Note 5)~~
- [Two or one elective](#)

Term 2B (Spring)

- [CS 240](#) Data Structures and Data Management
- [CS 247](#) Software Engineering Principles
- [CS 348](#) Introduction to Database Management **(D)**
- [ECE 192](#) Engineering Economics and Impact on Society **(D)**
- [MATH 239](#) Introduction to Combinatorics
- [SE 202](#) Seminar
- ~~Elective~~ [One or zero elective](#) *(see Note 1)*

Term 3A (Winter)

- [CS 341](#) Algorithms
- [CS 349](#) User Interfaces **or CS449 Human-Computer Interaction or MSC1343 Human-Computer Interaction (D)**

- [MATH 213](#) Signals, Systems, and Differential Equations
- [SE 301](#) Seminar
- [SE 350](#) Operating Systems
- [SE 465](#) Software Testing and Quality Assurance
- ~~Elective~~ One or zero elective (see ~~Notes 1 and 2~~)

Term 3B (Fall)

- [CS 343](#) Concurrent and Parallel Programming **(D)**
- [ECE 358](#) Computer Networks **(D)**
- [SE 302](#) Seminar
- [SE 380](#) Introduction to Feedback Control **(D)**
- [SE 390](#) Design Project Planning
- [SE 464](#) Software Design and Architectures
- ~~Elective~~ One or zero elective (see ~~Notes 1 and 2~~)

Term 4A (Spring Stream 8/Fall Stream 8X)

- [SE 401](#) Seminar
- [SE 463](#) Software Requirements Specification and Analysis
- [SE 490](#) Design Project 1
- Three ~~electives~~ or two electives (see ~~Notes 1 and 3~~)

Term 4B (Winter)

- [SE 402](#) Seminar
- [SE 491](#) Design Project 2
- Four ~~electives~~ or three electives (see ~~Notes 1 and 3~~)

Overview of Electives

There are 12 electives. These electives must include three Advanced Technical Electives, four Science Course Electives, and three Linkage Electives. For their remaining two open electives, students may choose to take additional courses from the elective lists below or any other 0.5 credit course(s) for which they meet the requisites. Advanced Technical Electives may not be taken before the 3A term.

Advanced Technical Electives

The three advanced technical electives (ATEs) comprise selections from CS, ECE, and elsewhere in the Faculties of Mathematics and Engineering. ~~fourth-year CS or ECE courses offerings.~~ Students are advised to plan ahead when selecting ATEs. Most ATEs are not offered every term, and some ATEs have other ATEs as prerequisites. The academic advisors may approve other courses.

CS List

One of the following CS courses:

- [CS 360](#) Introduction to the Theory of Computing
- [CS 365](#) Models of Computation
- [CS 370](#) Numerical Computation
- [CS 371/AMATH242](#) Introduction to Computational Mathematics
- [CS 442](#) Principles of Programming Languages
- [CS 444](#) Compiler Construction
- [CS 448](#) Database Systems Implementation
- [CS 449](#) Human-Computer Interaction
- [CS 450](#) Computer Architecture
- [CS 451](#) Data-Intensive Distributed Computing
- [CS 452](#) Real-time Programming
- [CS 454](#) Distributed Systems
- [CS 457](#) System Performance Evaluation
- [CS 458](#) Computer Security and Privacy
- [CS 462](#) Formal Languages and Parsing
- [CS 466](#) Algorithm Design and Analysis
- [CS 479](#) Neural Networks
- [CS 480](#) Introduction to Machine Learning
- [CS 484](#) Computational Vision
- [CS 485](#) Statistical and Computational Foundations of Machine Learning
- [CS 486](#) Introduction to Artificial Intelligence
- [CS 487](#) Introduction to Symbolic Computation
- [CS 488](#) Introduction to Computer Graphics
- [CS 489](#) Advanced Topics in Computer Science

ECE List

One of the following ECE courses:

- [ECE 313](#) Digital Signal Processing
- [ECE 320](#) Computer Architecture
- [ECE 327](#) Digital Hardware Systems
- [ECE 340](#) Electronic Circuits 2
- [ECE 409](#) Cryptography and System Security
- [ECE 416](#) Advanced Topics in Networking
- [ECE 417](#) Image Processing
- [ECE 423](#) Embedded Computer Systems
- [ECE 454](#) Distributed Computing
- [ECE 455](#) Embedded Software
- [ECE 457A](#) Co-operative and Adaptive Algorithms
- [ECE 457B](#) Fundamentals of Computational Intelligence
- [ECE 457C](#) Reinforcement Learning
- [ECE 458](#) Computer Security
- [ECE 459](#) Programming for Performance
- [ECE 481](#) Digital Control Systems
- [ECE 486](#) Robot Dynamics and Control
- [ECE 488](#) Multivariable Control Systems

- [ECE 493](#) Special Topics in Electrical and Computer Engineering
- [ECE 495](#) Autonomous Vehicles

One additional course from the CS and ECE Lists above, or from the Extended List below.

Extended List

- [CO 331](#) Coding Theory
- [CO 342](#) Introduction to Graph Theory
- [CO 351](#) Network Flow Theory
- [CO 353](#) Computational Discrete Optimization
- [CO 367](#) Nonlinear Optimization
- [CO 456](#) Introduction to Game Theory
- [CO 481/CS467/PHYS467](#) Introduction to Quantum Information Processing
- [CO 485](#) The Mathematics of Public-Key Cryptography
- [CO 487](#) Applied Cryptography
- [MSCI 343](#) Human-Computer Interaction
- [MSCI 446](#) Introduction to Machine Learning
- [MSCI 543](#) Analytics and User Experience
- [MTE 544](#) Autonomous Mobile Robots
- [MTE 546](#) Multi-sensor Data Fusion
- [SE 498](#) Advanced Topics in Software Engineering
- [STAT 440](#) Computational Inference
- [STAT 441](#) Statistical Learning - Classification
- [STAT 442](#) Data Visualization
- [STAT 444](#) Statistical Learning - Advanced Regression
- [SYDE 533](#) Conflict Resolution
- [SYDE 543](#) Cognitive Ergonomics
- [SYDE 548](#) User Centred Design Methods
- [SYDE 552/BIOL487](#) Computational Neuroscience
- [SYDE 556](#) Simulating Neurobiological Systems
- [SYDE 575](#) Image Processing

Science Course Electives

Normally, the science course electives (SCEs) are in the natural sciences, chosen from the list below. Alternate courses may be chosen in consultation with the SE academic advisors.

~~Two~~ Three of

- [AMATH 382/BIOL 382](#)
- [BIOL 110](#), [BIOL 120](#), ([BIOL 130](#) and [BIOL 130L](#)), [BIOL 150](#), [BIOL 165](#), [BIOL 211](#), [BIOL 239](#), ([BIOL 240](#) and [BIOL 240L](#)), [BIOL 241](#), [BIOL 273](#), [BIOL 280/ PHYS 280](#), [BIOL 365](#), ([BIOL 373](#) and [BIOL 373L](#)), [BIOL 376](#), [BIOL 382/AMATH 382](#), [BIOL 476](#), [BIOL 469](#), [BIOL 489](#)
- [CHE 161](#)
- ([CHEM 123](#) and [CHEM 123L](#)), [CHEM 209](#), ([CHEM 237](#) and [CHEM 237L](#)), [CHEM 254](#), ([CHEM 262](#) and [CHEM 262L](#)), [CHEM 266](#), [CHEM 356](#), ~~[CHEM 404](#)~~
- [CS 482](#)
- [EARTH 121](#), [EARTH 122](#), [EARTH 123](#), [EARTH 221](#), [EARTH 270](#), [EARTH 281](#)
- [ECE 105](#), [ECE 106](#), [ECE 231](#), [ECE 403](#), [ECE 404](#), [ECE 405](#)
- [ENVE 275](#)

- [ENVS 200](#)
- [NE 222](#)
- [PHYS 115, PHYS 121, PHYS 122, PHYS 124, PHYS 125, PHYS 175, PHYS 233, PHYS 234, PHYS 263, PHYS 275, PHYS 280/BIOL 280, PHYS 334, PHYS 335, PHYS 375, PHYS 380, PHYS 468](#)
- [PSYCH 207, PSYCH 261, PSYCH 306, PSYCH 307](#)
- [SCI 200, SCI 201, SCI 238, SCI 250](#)

Physics Requirement

One of the Science Elective courses must be a physics course from the following list:

[ECE 105 Classical Mechanics](#)

[PHYS 115 Mechanics](#)

[PHYS 121 Mechanics](#)

Sustainability Requirement

Choose one elective course related to sustainability from the following lists. This course may also be counted as a Science Course Elective, a List A Complementary Studies Elective, a List C Complementary Studies Elective, or an open elective.

Sustainability courses that are also on Engineering's Complementary Studies List A Impact:

[ENVS 105 Environmental Sustainability and Ethics](#)

[ENVS 205 Sustainability: The Future We Want](#)

[ERS 215 Environmental and Sustainability Assessment 1](#)

[GEOG 203 Environment and Development in a Global Perspective](#)

[GEOG 207 Climate Change Fundamentals](#)

Sustainability courses that are also on Engineering's Complementary Studies List C Humanities and Social Sciences:

[ENBUS 102 Introduction to Environment and Business](#)

[ENBUS 211 Principles of Marketing for Sustainability Professionals](#)

[ENGL 248 Literature for an Ailing Planet](#)

[ENVS 220 Ecological Economics](#)

[ERS 215 Environmental and Sustainability Assessment 1](#)

[ERS 225 Gendering Environmental Politics](#)

[ERS 253 Communities and Sustainability](#)

[ERS 294/RS 285 The Sacred Earth: Religion and Ecology](#)

[ERS 320 Economics and Sustainability](#)

[ERS 328 Environmental Politics and System Change](#)

[ERS 361/GEOG 361 Food Systems and Sustainability](#)

[ERS 370 Corporate Sustainability: Issues and Prospects](#)

[ERS 372 First Nations and the Environment](#)

[ERS 404/PSCI 432 Global Environmental Governance](#)

[GEOG 207 Climate Change Fundamental](#)

[GEOG 225 Global Environment and Health](#)

[PACS 310 Peace and the Environment](#)

[PHIL 224 Environmental Ethics](#)

[THPERF 374 Sustainability and Design](#)

Sustainability courses that are also on the Natural Science Electives List:

SCI 200 Energy: Its Development, Use and Issues

SCI 201 Global Warming and Climate Change

EARTH 270 Disasters and Natural Hazards

ENVS 200 Ecological Economics

BIOL 489 Arctic Ecology

Sustainability courses that also count as open electives:

GEOG 459 Energy and Sustainability

ERS 270 Introduction to Sustainable Agroecosystems

ERS 316 Urban Water and Wastewater Systems: Integrated Planning and Management

PLAN 451 Tools for Sustainable Communities

Linkage Electives

Three linkage electives (LEs) courses as specified below. Students should be aware that these courses may have enrolment limits, or may not fit their schedules.

One course on Impact of Technology and/or Engineering on Society:

- [Complementary Studies Elective](#) List A

One additional course on Humanities and Social Sciences (excluding courses concentrated on development of language or other skills):

- [Complementary Studies Elective](#) List C

One course on Communications (~~see Note 6~~)

- [COMMST 100](#)
- [COMMST 223](#)
- [EMLS 101R](#)
- [EMLS 102R](#)
- [ENGL 109](#)
- [ENGL 119](#)
- [ENGL 129R/EMLS 129R](#)
- [ENGL 209](#)
- [ENGL 210E](#)

Notes

- ~~1. There are 10 electives. These electives must include three Advanced Technical Electives, two Science Course Electives, and three Linkage Electives. For their remaining two electives, students may choose to take additional courses from the elective lists above or any other 0.5 credit course(s) for which they meet the requisites. Advanced Technical Electives may not be taken before the 3A term.~~
- ~~2. Students must take one elective in third year, but can choose to take it in either 3A or 3B. Students may take electives in both terms if they choose.~~
- ~~3. Students may choose to take four electives in 4A and three electives in 4B, instead of three in 4A and four in 4B.~~
- ~~4. Students enrolled in Software Engineering will only be permitted to use the WD and WF (see Grades for descriptions) provisions used in the Faculty of Mathematics to withdraw from extra courses taken above the degree requirements.~~

~~5.—The linkage elective on communication (Undergraduate Communication Requirement) is normally taken in the 2A term. It must be completed with a grade of at least 60% prior to enrolling in the 3A term.~~

Undergraduate Communication Requirement

Strong communication skills are essential to academic, professional, and personal success. As such, Software Engineering students must take a course from the Linkage Elective [Undergraduate Communication Requirement](#) List. ~~In the 2A term.~~ **It must be completed with a grade of at least 60% prior to enrolling in the 3A term.** This elective list is intended to include all of Mathematics Undergraduate Communication Requirement List 1, and selections from Mathematics Undergraduate Communication Requirement List 2. Communication skills are further developed and evaluated in [PD 11](#), [SE 101](#), [SE 390](#), [SE 490](#), and [SE 491](#).

Professional Development Courses

Five professional development (PD) courses are required as described in the BAsC and BSE specific degree requirements section on [Work Terms](#). Two core PD courses are specified for all engineering students: [PD 19](#) and [PD 20](#). One core PD course is specified for all mathematics students, [PD 11](#). Due to the importance of understanding the legal and ethical ramifications of software development, Software Engineering students are also required to take [PD 10](#). This course replaces one of the PD electives, such that Software Engineering students have four core PD courses ([PD 10](#), [PD 11](#), [PD 19](#), and [PD 20](#)) and one PD elective course. Software Engineering students are automatically enrolled in [PD 19](#) and [PD 20](#) but must enrol in [PD 10](#), [PD 11](#), and the elective PD course using the normal Quest enrolment process.

Software Engineering

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The Honours Software Engineering plan leads to a Bachelor of Software Engineering (BSE) degree.

Admissions

The Software Engineering Board, in consultation with the faculties of Engineering and Mathematics and their admissions committees, determines the admission requirements for Software Engineering.

For details on admission information, see the [Admissions section](#) of this Calendar.

Options, Specializations, Minors, and Joint Honours

Software Engineering students are considered as both Mathematics and Engineering students, and can thus take advantage of degree enhancements available to students from either faculty. These enhancements take the form of additional plans such as options, specializations, [minors](#), and joint honours.

Software Engineering students are eligible for either the Artificial Intelligence Option (Engineering) or the Artificial Intelligence Specialization (Computer Science), but cannot graduate with both degree enhancements. See the full list of [Computer Science specializations](#) or the full list of [Options, Specializations and Electives for Engineering Students](#).

The following Mathematics Joint Honours plans are also approved as additional plans for BSE students:

- [Joint Applied Mathematics](#)
- [Joint Combinatorics and Optimization](#)
- [Joint Pure Mathematics](#), and

- [Joint Statistics](#)

BSE students are not eligible to add Joint Computer Science (Bachelor of Mathematics), Joint Bachelor of Computer Science plans, or stand-alone BMath Honours plans from the Faculty of Mathematics. BSE students pursuing a Joint Honours plan are not required to satisfy the Table 2 Faculty Core Courses requirements in the degree requirements for all Mathematics students. These students are still required to fulfil all requirements for the BSE.

BSE students may be eligible to add other options, specializations, or minors in Mathematics, Engineering, or other faculties, subject to the approval of the Software Engineering associate director. Students should be aware that adding plans will constrain their choice of electives, and may require additional courses. Thus, it is advisable to start preparing for additional plans in the first and second years. Students should also consider the benefits of not adding plans, in that they are better able to personalize their curriculum if they have more flexibility in choosing their electives. Students interested in pursuing additional academic plans, see [invalid credential combinations](#).

Software Engineering Awards

Students in the Bachelor of Software Engineering plan are eligible for Awards of Excellence in the Faculty of Mathematics. Students in the Bachelor of Software Engineering plan are eligible for Awards of Excellence in the Faculty of Engineering.

Honours Software Engineering

The Software Engineering plan is offered jointly by the David R. Cheriton School of Computer Science and the Department of Electrical and Computer Engineering; it is offered primarily in the co-operative 8-stream. Students may choose to switch to the 8X-stream after 3B with advisor approval.

Students will be considered members of both the Faculty of Engineering and the Faculty of Mathematics, although for administrative purposes they will be registered officially in a separate unit. Students will be promoted based on the [Examinations and Promotions](#) rules used in the Faculty of Engineering. The Software Engineering plan is also considered an Honours Mathematics plan for purposes of student access to Mathematics courses. The Software Engineering advisor will advise students on how to achieve their academic goals.

Students enrolled in the Software Engineering will only be permitted to use the WD and WF (see Grades for description) provisions used in the Faculty of Mathematics to withdraw from extra courses taken above the degree requirements.

Legend for Study/Work Sequence Table

Key	Description
F,W,S	F=fall term, W=winter term, S=spring term
1,2,3,4 plus A or B	Denotes academic year and term.
WT	Denotes scheduled work terms.

Study/Work Sequence

Sequence	F	W	S	F	W	S	F	W	S	F	W	S	F	W
Stream 8	1A	1B	WT	2A	WT	2B	WT	3A	WT	3B	WT	4A	WT	4B
Stream 8X	1A	1B	WT	2A	WT	2B	WT	3A	WT	3B	WT	WT	4A	4B

Academic Curriculum

The term-by-term academic component of the curriculum is as follows:

Term 1A (Fall)

- [CS 137](#) Programming Principles
- [CHE 102](#) Chemistry for Engineers (D)
- [MATH 115](#) Linear Algebra for Engineering
- [MATH 117](#) Calculus 1 for Engineering
- [MATH 135](#) Algebra for Honours Mathematics
- [SE 101](#) Introduction to Methods of Software Engineering

Term 1B (Winter)

- [CS 138](#) Introduction to Data Abstraction and Implementation
- [ECE 124](#) Digital Circuits and Systems
- [ECE 140](#) Linear Circuits (D)
- [MATH 119](#) Calculus 2 for Engineering
- [SE 102](#) Seminar
- Elective

Term 2A (Fall)

- [CS 241](#) Foundations of Sequential Programs
- [ECE 222](#) Digital Computers
- [SE 201](#) Seminar
- [SE 212](#) Logic and Computation
- [STAT 206](#) Statistics for Software Engineering
- Two or one elective

Term 2B (Spring)

- [CS 240](#) Data Structures and Data Management
- [CS 247](#) Software Engineering Principles
- [CS 348](#) Introduction to Database Management (D)
- [ECE 192](#) Engineering Economics and Impact on Society (D)
- [MATH 239](#) Introduction to Combinatorics
- [SE 202](#) Seminar

- One or zero elective

Term 3A (Winter)

- [CS 341](#) Algorithms
- [CS 349](#) User Interfaces or CS449 Human-Computer Interaction or MSC1343 Human-Computer Interaction (D)
- [MATH 213](#) Signals, Systems, and Differential Equations
- [SE 301](#) Seminar
- [SE 350](#) Operating Systems
- [SE 465](#) Software Testing and Quality Assurance
- One or zero elective

Term 3B (Fall)

- [CS 343](#) Concurrent and Parallel Programming (D)
- [ECE 358](#) Computer Networks (D)
- [SE 302](#) Seminar
- [SE 380](#) Introduction to Feedback Control (D)
- [SE 390](#) Design Project Planning
- [SE 464](#) Software Design and Architectures
- One or zero elective

Term 4A (Spring Stream 8/Fall Stream 8X)

- [SE 401](#) Seminar
- [SE 463](#) Software Requirements Specification and Analysis
- [SE 490](#) Design Project 1
- Three or two electives

Term 4B (Winter)

- [SE 402](#) Seminar
- [SE 491](#) Design Project 2
- Four or three electives

Overview of Electives

There are 12 electives. These electives must include three Advanced Technical Electives, four Science Course Electives, and three Linkage Electives. For their remaining two open electives, students may choose to take additional courses from the elective lists below or any other 0.5 credit course(s) for which

they meet the requisites. Advanced Technical Electives may not be taken before the 3A term.

Advanced Technical Electives

The three advanced technical electives (ATEs) comprise selections from CS, ECE, and elsewhere in the Faculties of Mathematics and Engineering. Students are advised to plan ahead when selecting ATEs. Most ATEs are not offered every term, and some ATEs have other ATEs as prerequisites. The academic advisors may approve other courses.

CS List

One of the following CS courses:

- [CS 360](#) Introduction to the Theory of Computing
- [CS 365](#) Models of Computation
- [CS 370](#) Numerical Computation
- [CS 371/AMATH242](#) Introduction to Computational Mathematics
- [CS 442](#) Principles of Programming Languages
- [CS 444](#) Compiler Construction
- [CS 448](#) Database Systems Implementation
- [CS 449](#) Human-Computer Interaction
- [CS 450](#) Computer Architecture
- [CS 451](#) Data-Intensive Distributed Computing
- [CS 452](#) Real-time Programming
- [CS 454](#) Distributed Systems
- [CS 457](#) System Performance Evaluation
- [CS 458](#) Computer Security and Privacy
- [CS 462](#) Formal Languages and Parsing
- [CS 466](#) Algorithm Design and Analysis
- [CS 479](#) Neural Networks
- [CS 480](#) Introduction to Machine Learning
- [CS 484](#) Computational Vision
- [CS 485](#) Statistical and Computational Foundations of Machine Learning
- [CS 486](#) Introduction to Artificial Intelligence
- [CS 487](#) Introduction to Symbolic Computation
- [CS 488](#) Introduction to Computer Graphics
- [CS 489](#) Advanced Topics in Computer Science

ECE List

One of the following ECE courses:

- [ECE 313](#) Digital Signal Processing
- [ECE 320](#) Computer Architecture
- [ECE 327](#) Digital Hardware Systems
- [ECE 340](#) Electronic Circuits 2
- [ECE 409](#) Cryptography and System Security
- [ECE 416](#) Advanced Topics in Networking
- [ECE 417](#) Image Processing
- [ECE 423](#) Embedded Computer Systems
- [ECE 454](#) Distributed Computing

- [ECE 455](#) Embedded Software
- [ECE 457A](#) Co-operative and Adaptive Algorithms
- [ECE 457B](#) Fundamentals of Computational Intelligence
- [ECE 457C](#) Reinforcement Learning
- [ECE 458](#) Computer Security
- [ECE 459](#) Programming for Performance
- [ECE 481](#) Digital Control Systems
- [ECE 486](#) Robot Dynamics and Control
- [ECE 488](#) Multivariable Control Systems
- [ECE 493](#) Special Topics in Electrical and Computer Engineering
- [ECE 495](#) Autonomous Vehicles

One additional course from the CS and ECE Lists above, or from the Extended List below.

Extended List

- [CO 331](#) Coding Theory
- [CO 342](#) Introduction to Graph Theory
- [CO 351](#) Network Flow Theory
- [CO 353](#) Computational Discrete Optimization
- [CO 367](#) Nonlinear Optimization
- [CO 456](#) Introduction to Game Theory
- [CO 481/CS467/PHYS467](#) Introduction to Quantum Information Processing
- [CO 485](#) The Mathematics of Public-Key Cryptography
- [CO 487](#) Applied Cryptography
- [MSCI 343](#) Human-Computer Interaction
- [MSCI 446](#) Introduction to Machine Learning
- [MSCI 543](#) Analytics and User Experience
- [MTE 544](#) Autonomous Mobile Robots
- [MTE 546](#) Multi-sensor Data Fusion
- [SE 498](#) Advanced Topics in Software Engineering
- [STAT 440](#) Computational Inference
- [STAT 441](#) Statistical Learning - Classification
- [STAT 442](#) Data Visualization
- [STAT 444](#) Statistical Learning - Advanced Regression
- [SYDE 533](#) Conflict Resolution
- [SYDE 543](#) Cognitive Ergonomics
- [SYDE 548](#) User Centred Design Methods
- [SYDE 552/BIOL487](#) Computational Neuroscience
- [SYDE 556](#) Simulating Neurobiological Systems
- [SYDE 575](#) Image Processing

Science Course Electives

Normally, the science course electives (SCEs) are in the natural sciences, chosen from the list below. Alternate courses may be chosen in consultation with the SE academic advisors.

Two of

- [AMATH 382/BIOL 382](#)

- [BIOL 110](#), [BIOL 120](#), ([BIOL 130](#) and [BIOL 130L](#)), [BIOL 150](#), [BIOL 165](#), [BIOL 211](#), [BIOL 239](#), ([BIOL 240](#) and [BIOL 240L](#)), [BIOL 241](#), [BIOL 273](#), [BIOL/280/ PHYS 280](#), [BIOL 365](#), ([BIOL 373](#) and [BIOL 373L](#)), [BIOL 376](#), [BIOL 382/AMATH 382](#), [BIOL 476](#), [BIOL 469](#), [BIOL 489](#)
- [CHE 161](#)
- ([CHEM 123](#) and [CHEM 123L](#)), [CHEM 209](#), ([CHEM 237](#) and [CHEM 237L](#)), [CHEM 254](#), ([CHEM 262](#) and [CHEM 262L](#)), [CHEM 266](#), [CHEM 356](#)
- [CS 482](#)
- [EARTH 121](#), [EARTH 122](#), [EARTH 123](#), [EARTH 221](#), [EARTH 270](#), [EARTH 281](#)
- [ECE 105](#), [ECE 106](#), [ECE 231](#), [ECE 403](#), [ECE 404](#), [ECE 405](#)
- [ENVE 275](#)
- [ENVS 200](#)
- [NE 222](#)
- [PHYS 115](#), [PHYS 121](#), [PHYS 122](#), [PHYS 124](#), [PHYS 125](#), [PHYS 175](#), [PHYS 233](#), [PHYS 234](#), [PHYS 263](#), [PHYS 275](#), [PHYS 280/BIOL 280](#), [PHYS 334](#), [PHYS 335](#), [PHYS 375](#), [PHYS 380](#), [PHYS 468](#)
- [PSYCH 207](#), [PSYCH 261](#), [PSYCH 306](#), [PSYCH 307](#)
- [SCI 200](#), [SCI 201](#), [SCI 238](#), [SCI 250](#)

Physics Requirement

One of the Science Elective courses must be a physics course from the following list:

[ECE 105](#) Classical Mechanics

[PHYS 115](#) Mechanics

[PHYS 121](#) Mechanics

Sustainability Requirement

Choose one elective course related to sustainability from the following lists. This course may also be counted as a Science Course Elective, a List A Complementary Studies Elective, a List C Complementary Studies Elective, or an open elective.

Sustainability courses that are also on Engineering's Complementary Studies List A Impact:

[ENVS 105](#) Environmental Sustainability and Ethics

[ENVS 205](#) Sustainability: The Future We Want

[ERS 215](#) Environmental and Sustainability Assessment 1

[GEOG 203](#) Environment and Development in a Global Perspective

[GEOG 207](#) Climate Change Fundamentals

Sustainability courses that are also on Engineering's Complementary Studies List C Humanities and Social Sciences:

[ENBUS 102](#) Introduction to Environment and Business

[ENBUS 211](#) Principles of Marketing for Sustainability Professionals

[ENGL 248](#) Literature for an Ailing Planet

[ENVS 220](#) Ecological Economics

[ERS 215](#) Environmental and Sustainability Assessment 1

[ERS 225](#) Gendering Environmental Politics

[ERS 253](#) Communities and Sustainability

[ERS 294/RS 285](#) The Sacred Earth: Religion and Ecology

[ERS 320](#) Economics and Sustainability

[ERS 328](#) Environmental Politics and System Change

[ERS 361/GEOG 361](#) Food Systems and Sustainability
[ERS 370](#) Corporate Sustainability: Issues and Prospects
[ERS 372](#) First Nations and the Environment
[ERS 404/PSCI 432](#) Global Environmental Governance
[GEOG 207](#) Climate Change Fundamental
[GEOG 225](#) Global Environment and Health
[PACS 310](#) Peace and the Environment
[PHIL 224](#) Environmental Ethics
[THPERF 374](#) Sustainability and Design

Sustainability courses that are also on the Natural Science Electives List:

[SCI 200](#) Energy: Its Development, Use and Issues
[SCI 201](#) Global Warming and Climate Change
[EARTH 270](#) Disasters and Natural Hazards
[ENVS 200](#) Ecological Economics
[BIOL 489](#) Arctic Ecology

Sustainability courses that also count as open electives:

[GEOG 459](#) Energy and Sustainability
[ERS 270](#) Introduction to Sustainable Agroecosystems
[ERS 316](#) Urban Water and Wastewater Systems: Integrated Planning and Management
[PLAN 451](#) Tools for Sustainable Communities

Linkage Electives

Three linkage electives (LEs) courses as specified below. Students should be aware that these courses may have enrolment limits, or may not fit their schedules.

One course on Impact of Technology and/or Engineering on Society:

- [Complementary Studies Elective](#) List A

One additional course on Humanities and Social Sciences (excluding courses concentrated on development of language or other skills):

- [Complementary Studies Elective](#) List C

One course on Communications

- [COMMST 100](#)
- [COMMST 223](#)
- [EMLS 101R](#)
- [EMLS 102R](#)
- [ENGL 109](#)
- [ENGL 119](#)
- [ENGL 129R/EMLS 129R](#)
- [ENGL 209](#)
- [ENGL 210E](#)

Undergraduate Communication Requirement

Strong communication skills are essential to academic, professional, and personal success. As such, Software Engineering students must take a course from the Linkage Elective [Undergraduate Communication Requirement](#) List. It must be completed with a grade of at least 60% prior to enrolling in the 3A term. This elective list is intended to include all of Mathematics Undergraduate Communication Requirement List 1, and selections from Mathematics Undergraduate Communication Requirement List 2. Communication skills are further developed and evaluated in [PD 11](#), [SE 101](#), [SE 390](#), [SE 490](#), and [SE 491](#).

Professional Development Courses

Five professional development (PD) courses are required as described in the BAsC and BSE specific degree requirements section on [Work Terms](#). Two core PD courses are specified for all engineering students: [PD 19](#) and [PD 20](#). One core PD course is specified for all mathematics students, [PD 11](#). Due to the importance of understanding the legal and ethical ramifications of software development, Software Engineering students are also required to take [PD 10](#). This course replaces one of the PD electives, such that Software Engineering students have four core PD courses ([PD 10](#), [PD 11](#), [PD 19](#), and [PD 20](#)) and one PD elective course. Software Engineering students are automatically enrolled in [PD 19](#) and [PD 20](#) but must enrol in [PD 10](#), [PD 11](#), and the elective PD course using the normal Quest enrolment process.

2.2 Software Engineering Sequence Change

Summary:

Minor Modification

Provide an 8x-stream option to software engineering students.

Background & Rationale

Students have requested flexibility for Stream-8 or Stream-8x. Software Engineering Student Society provided two pages of written support. CEE provided one page of written support. ECE and CS have been consulted about teaching loads. The change to SE463 prerequisites aligns with this change, and creates opportunities for other Engineering students. This change will also make it easier for software engineering to manage outgoing exchange.

Study/work Sequence MARK UP

Legend for Study/Work Sequence Information Table

Key	Description
S/S	Engineering sequence/stream: 8=Stream 8, 4=Stream 4; 8D, 4D=two academic terms and two work terms back to back; 4F=both streams meet up in the 3B fall term; 8S and 4S=special sequencing of terms; 8X=one extended work term
F,W,S	Terms: F=September-December; W=January-April; S=May-August
1,2,3,4 plus A or B	Denotes academic year and term.
WT	Denotes scheduled work term.
1	The streaming for Computer Engineering varies depending on demand. With permission and co-ordination through the Electrical and Computer Engineering Undergraduate Office, it is possible to create eight-month co-operative work terms by rearranging the term sequence.

Study/Work Sequence Information

Plan	S/S	F	W	S	F	W	S	F	W	S	F	W	S	F	W
Architectural	4S	1A	WT	1B	WT	2A	WT	2B	WT	3A	WT	3B	4A	WT	4B
Biomedical, Mechatronics, <u>Software</u>	8X	1A	1B	WT	2A	WT	2B	WT	3A	WT	3B	WT	WT	4A	4B
Chemical	4D	1A	WT	1B	WT	2A	WT	2B	WT	3A	3B	WT	WT	4A	4B
Chemical	8D	1A	1B	WT	2A	WT	2B	WT	3A	WT	WT	3B	WT	4A	4B
Civil, Computer ¹ , Management, Mechanical	8	1A	1B	WT	2A	WT	2B	WT	3A	WT	3B	WT	4A	WT	4B
Computer ¹ , Electrical	4F	1A	WT	1B	WT	2A	WT	2B	WT	3A	3B	WT	4A	WT	4B
Environmental, Geological, Mechanical, Mechatronics, Systems Design	4	1A	WT	1B	WT	2A	WT	2B	WT	3A	WT	3B	WT	4A	4B
Nanotechnology	8S	1A	1B	WT	2A	WT	2B	WT	WT	3A	3B	WT	WT	4A	4B
Software	8	1A	1B	WT	2A	WT	2B	WT	3A	WT	3B	WT	4A	WT	4B

**OFFICE OF THE REGISTRAR REPORT TO
SENATE UNDERGRADUATE COUNCIL
May 2023**

1. COURSE CHANGES

- 1.1. Repeat Rules for Topic Courses
- 1.2. Consent to Add or Drop a Course

2. REGULATIONS

- 2.1. Admission Fraud
- 2.2. Admission Requirements – Duolingo Component Scores
- 2.3. Jurisdiction – Calendar Content
- 2.4. Jurisdiction – Cancelling Scheduled Offerings

**OFFICE OF THE REGISTRAR REPORT TO
SENATE UNDERGRADUATE COUNCIL
May 2023**

1. COURSE CHANGES

1.1. Repeat Rules for Topic Courses

Effective date: September 1, 2024

Background and rationale: Beginning with the 2024-25 Undergraduate Studies Academic Calendar (USAC), the course repetition rules for topics courses will be displayed. This information has always been available in Quest, but only visible in the USAC if faculties/academic units chose to display it via a note included in the course description. The 2024-25 USAC will standardize the approach by displaying it for all, providing greater transparency for students.

The Office of the Registrar is presenting, on behalf of faculties, courses where the topic rules are changing (changes highlighted in yellow), either to correct errors of what is coded in Quest, or to clean up their rules before they are displayed to students.

Courses:

Faculty	Course	Title	Unit	Repeat	Total Allowed Completions	Total Allowed Units	Allow Multiple in a Term
ARTS	SMF 317	Pre-Modern Hist of Sexuality	0.5	Y -> N	10 -> 1	5.0 -> 0.5	Y -> N
ARTS	SMF 494	Seminar: Sexuality	0.5	Y	10 -> 3	5.0 -> 1.5	N -> Y
ARTS	SMF 496	Seminar: Family Studies	0.5	Y	10 -> 3	5.0 -> 1.5	Y
ENG	AE 495	Design Intensive Special Topics in Architectural Engineering	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	AE 497	Special Topics in Architectural Engineering	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	ARCH 510	Special Topics in Visual and Digital Media	0.5	N -> Y	1 -> 3	0.5 -> 1.5	N -> Y
ENG	ARCH 520	Special Topics in Urbanism and Landscape	0.5	N -> Y	1 -> 3	0.5 -> 1.5	N -> Y
ENG	ARCH 540	Topics: Archit Hist & Theory	0.5	Y	10 -> 3	5.0 -> 1.5	Y
ENG	ARCH 570	Topics: Building Tech & Env	0.5	Y	10 -> 3	5.0 -> 1.5	Y
ENG	ARCH 580	Topics: Equity & Space	0.5	Y	10 -> 3	5.0 -> 1.5	Y
ENG	BET 412	Advanced Topics in Entrepreneurship	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	BME 587	Special Topics in Biomedical Signals	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	BME 589	Topics: Biomedical Devices	0.5	Y	6 -> 10	3.0 -> 5.0	Y
ENG	ECE 406	Algorithm Design & Analysis	0.5	Y -> N	9 -> 1	5.0 -> 0.5	N
ENG	ECE 409	Cryptography & System Security	0.5	Y -> N	9 -> 1	5.0 -> 0.5	N
ENG	ECE 493	Special Topics	0.5	Y	9 -> 10	5.0	Y
ENG	ENVE 495	Design Intensive Special Topics in Environmental Engineering	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y

ENG	ENVE 497	Special Topics in Environmental Engineering	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	GENE 199	Topics: First-Year Eng	0.5	Y	10	5.0	N -> Y
ENG	GENE 299	Topics: Second-Year Eng	0.5	Y	10	5.0	N -> Y
ENG	GENE 301	Special Directed Studies	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	GENE 302	Special Directed Studies	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	GENE 315	Special Directed Non-Technical Studies	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	GENE 399	Topics: Third-Year Eng	0.5	Y	10	5.0	N -> Y
ENG	GENE 415	Special Directed Non-Technical Studies	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	GENE 499	Topics: Fourth-Year Eng	0.5	Y	10	5.0	N -> Y
ENG	GENE 21A	Topics: Techn Exchange Courses	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	GENE 21C	Topics: Techn Exchange Courses	0.5	Y	4 -> 10	2.0 -> 5.0	Y
ENG	GENE 21L	Topics: Techn Exchange Courses	0.5	Y	3 -> 10	1.5 -> 5.0	Y
ENG	GENE 21R	Topics: Techn Exchange Courses	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	GENE 21S	Topics: Techn Exchange Courses	0.5	Y	5 -> 10	10.0 -> 5.0	Y
ENG	GENE 23E	Topics: Nat Sci Exch Courses	0.5	Y	1 > 10	0.5 -> 5.0	Y
ENG	GENE 23K	Topics: Nat Sci Exch Courses	0.5	Y	1 > 10	0.5 -> 5.0	Y
ENG	GENE 23Q	Topics: Nat Sci Exch Courses	0.5	Y	1 > 10	0.5 -> 5.0	Y
ENG	GENE 23Q	Topics: Nat Sci Exch Courses	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	GENE 23S	Topics: Nat Sci Exch Courses	0.5	Y	1 > 10	0.5 -> 5.0	Y
ENG	GEOE 495	Design Intensive Special Topics in Geological Engineering	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	GEOE 497	Special Topics in Geological Engineering	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	ME 595	Special Topics	0.5	Y	9 -> 10	5.0	Y
ENG	ME 598	Special Topics	0.5	Y	1 -> 10	0.5 -> 5.0	Y
ENG	MSCI 597	Topics: Complementary Studies	0.5	Y	4 -> 10	2.0 -> 5.0	Y
ENG	MSCI 598	Special Topics	0.5	Y	4 -> 10	2.0 -> 5.0	Y
ENG	MTE 597	Special Topics in Mechatronics Engineering: Software Systems	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	MTE 598	Special Topics in Mechatronics Engineering: Hardware Systems	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	MTE 599	Special Topics in Mechatronics Engineering: Mechanical Systems	0.5	N -> Y	1 -> 10	0.5 -> 5.0	N -> Y
ENG	NE 452	Topics: Nanoscale Simulations	0.5	Y -> N	10 -> 1	5.0 -> 0.5	N
ENG (VPA)	STV 201	Special Topics	0.5	Y	9 -> 10	5.0	N -> Y
ENG (VPA)	STV 401	Advanced Topics	0.5	Y	9 -> 10	5.0	N -> Y
ENV	ENBUS 375	Env & Bus Special Topics	0.5	Y	2 -> 3	0.5 -> 1.5	Y
ENV	ENBUS 475	Env & Bus Special Topics	0.5	Y	5 -> 3	10.0->1.5	Y
ENV	ENVS 274	Env Special Topics	0.5	Y	4 -> 3	2.0 -> 1.5	Y
ENV	ENVS 374	Env Special Topics	0.5	Y	4 -> 3	2.0 -> 1.5	Y
ENV	ENVS 474	Env Special Topics	0.5	N -> Y	3	1.5	Y
ENV	ERS 275	Special Readings	0.5	Y	9 -> 3	5.0 -> 1.5	Y
ENV	ERS 373	Topics: Env/Resources/Sust	1.0	Y	9 -> 3	0.5 -> 3.0	Y
ENV	ERS 374	Topics: Env/Resources/Sust	1.0	Y	9 -> 3	1.0 -> 3.0	Y
ENV	ERS 375	Readings: Env/Resources/Sust	0.5	Y	9 -> 3	5.0 -> 1.5	Y
ENV	ERS 473	Topics: Env/Resources/Sust	0.5	Y	9 -> 3	0.5 -> 1.5	Y

ENV	ERS 474	Topics: Env/Resources/Sust	1.0	Y	9 -> 3	1.0 -> 3.0	Y
ENV	ERS 475	Readings: Env/Resources/Sust	0.5	Y	10 -> 3	5.0 -> 1.5	Y
ENV	GEOG 374	Special Topics: Geography	0.5	Y	2 -> 3	1.0 -> 1.5	Y
ENV	GEOG 474	Special Topics: Geography	0.5	Y	9 -> 3	5.0 -> 1.5	Y
ENV	GEGO 475	Independent Study	0.5	Y	9 -> 3	5.0 -> 1.5	Y
ENV	INDEV 275	Topics: Intl Development	0.5	Y	10 -> 3	5.0 -> 1.5	Y
ENV	INDEV 375	Topics: Intl Development	0.5	Y	10 -> 3	5.0 -> 1.5	Y
ENV	INDEV 474	Topics: Intl Development	0.5	Y	2 -> 3	1.0 -> 1.5	Y
ENV	INTEG 275	Topics: Knowledge Integration	0.5	Y	10 -> 3	5.0 -> 1.5	Y
ENV	INTEG 375	Topics: Knowledge Integration	0.5	Y	10 -> 3	5.0 -> 1.5	Y
ENV	INTEG 475	Special Topics	0.5	Y	2 -> 3	1.0 -> 1.5	Y
ENV	PLAN 474	Special Topics: Planning	0.5	Y	5 -> 3	2.5 -> 1.5	Y
ENV	PLAN 475	Special Topics: Planning	1.0	Y	2 -> 3	2.0 -> 3.0	Y
ENV	PLAN 485	Projects, Problems & Readings	0.5	Y	10 -> 3	5.0 -> 1.5	Y
ENV & SCI	AVIA 374	Special Topics	0.5	Y	3	1.5	N -> Y
ENV & SCI	AVIA 474	Special Topics	0.5	Y	1 -> 3	0.5 -> 1.5	Y
ENV & SCI	AVIA 475	Independent Studies	0.5	Y	1 -> 3	0.5 -> 1.5	N -> Y
HLTH	GERON 401A	Independent Study in Aging	0.5	Y -> N	10 -> 1	5.0 -> 0.5	Y -> N
HLTH	HEALTH 395	Study Abroad	2.5	Y	1 -> 2	2.5 -> 5.0	N
HLTH	HEALTH 490	Interdisciplinary Health Topics	0.5	Y	3	1.5	N -> Y
HLTH	HLTH 173	Contemporary Issues in Health 1	0.5	N -> Y	1 -> 3	0.5 -> 1.5	N -> Y
HLTH	HLTH 273	Contemporary Issues in Health 2	0.5	Y	10 -> 3	5.0 -> 1.5	Y
HLTH	HLTH 373	Contemporary Issues in Health 3	0.5	Y	10 -> 3	5.0 -> 1.5	Y
HLTH	HLTH 472	Independent Study	0.5	Y	10 -> 3	5.0 -> 1.5	Y
HLTH	HLTH 473	Contemporary Issues in Health 4	0.5	Y	10 -> 3	5.0 -> 1.5	Y
HLTH	KIN 431	Research Proposal	0.5	Y	2 -> 3	1.0 -> 1.5	Y
HLTH	KIN 432	Research Project	0.5	N -> Y	1 -> 3	0.5 -> 1.5	N -> Y
HLTH	KIN 433	Senior Essay	0.5	N -> Y	1 -> 3	0.5 -> 1.5	N -> Y
HLTH	KIN 470	Seminar in Kinesiology	0.5	Y -> N	10 -> 1	5.0 -> 0.5	Y -> N
HLTH	KIN 471	Contemporary Issues in Kinesiology	0.5	Y	10 -> 3	5.0 -> 1.5	Y
HLTH	KIN 472	Directed Study in Special Topics	0.5	Y	9 -> 3	5.0 -> 1.5	Y
HLTH	REC 172	Special Topics in Leisure Studies 1	0.5	N -> Y	1 -> 3	0.5 -> 1.5	N -> Y
HLTH	REC 272	Special Topics in Leisure Studies 2	0.5	N -> Y	1 -> 3	0.5 -> 1.5	N -> Y
HLTH	REC 372	Special Topics in Leisure Studies 3	0.5	Y	1 -> 3	0.5 -> 1.5	N -> Y
HLTH	REC 472	Special Topics in Recreation and Leisure Studies 4	0.5	Y	2 -> 3	1.0 -> 1.5	Y
MATH	CS 497	Multidisciplinary Studies	0.5	Y	10	5.0	N -> Y
MATH	PMATH 499	Readings	0.5	Y	6 -> 10	3.0 -> 5.0	Y
SCI	MNS 410	Topics: Solid-State Materials	0.5	Y -> N	5 -> 1	0.5	Y -> N
SCI	MNS 431	Topics: Nano-Biomaterials	0.5	Y -> N	5 -> 1	0.5	N
SCI	OPTOM 460	Advanced Study Topics	0.5	Y	9 -> 4	5.0 -> 2.0	Y
SCI	PHARM 400	Independent Study 1	0.25	Y	7 -> 2	1.25 -> 0.5	Y
SCI	PHARM 401	Independent Study 2	0.25	Y	4 -> 2	1.0 -> 0.5	Y

1.2. Consent to Add or Drop a Course

Effective date: September 1, 2024

Background and rationale: Beginning with the 2024-25 Undergraduate Studies Academic Calendar (USAC), details about required consent to drop a course will be displayed. This information has always been available in Quest, but never visible in the USAC, whereas the USAC does display details about required consent to add a course (i.e., instructor consent or department consent). The 2024-25 USAC will share drop consent information with students, for greater transparency of what they might encounter when trying to drop a course.

The Office of the Registrar is presenting, on behalf of faculties, courses where the rules for consent to drop are changing (changes highlighted in yellow), to clean up their rules before they are displayed to students. In some cases, consent to add is also changing.

Courses:

Faculty	Course	Title	Consent to Add/Swap (current)	Consent to Add/Swap (change)	Consent to Drop (current)	Consent to Drop (change)
SCI	PHARM 400	Independent Study 1	Instructor	No change	No consent	Department
SCI	PHARM 401	Independent Study 2	Instructor	No change	No consent	Department
SCI	PHARM 430	Clinic 1: Primary Care	No consent	Instructor	Department	No change
SCI	PHARM 440	Clinic 2: Institutional	No consent	Instructor	Department	No change
SCI	PHARM 450	Clinic 3: Elective	No consent	Instructor	Department	No change

2. REGULATIONS

2.1. Admissions Fraud

Effective date: September 1, 2024

Background and rationale: The University of Waterloo has a process to deal with admissions fraud, however, a statement providing details of admissions fraud does not exist in the Undergraduate Studies Academic Calendar (USAC). Current information the University provides regarding admissions fraud is provided on the [Future Students website](#) as well as within [Policy 71](#) (if admission fraud is discovered after registration). The proposed USAC text, created by sampling other institutions and our own existing processes, was endorsed by Undergraduate Operations on April 25, 2023.

New Calendar Text:

Admissions Fraud

It is an applicant's responsibility to ensure that all application information is truthful, complete, and correct. All documentation in support of an application for admission or readmission will be verified for authenticity. If evidence of falsified information and/or omission is found in the submission of an application for admission or readmission, the University of Waterloo reserves the right to deny admission, revoke any offer of admission (conditional or final), residence, and/or financial support. Previous submission of falsified or fraudulent documentation may be considered in future applications made to Waterloo.

Students are required to produce documentation verifying their identity to obtain their student identification. Should evidence of admissions fraud be discovered after registration, students are subject to Policy 71 (Student Discipline), and the penalty may be expulsion.

We may disclose evidence of any misrepresentation, fraudulent or falsified documentation to all Canadian universities, to Citizenship and Immigration Canada, and to law enforcement personnel when appropriate.

2.2. **Admission Requirements – Duolingo Component Scores**

Effective date: September 1, 2024

Background and rationale: When the Duolingo English Language Proficiency Test was first introduced, there was not a means of reporting subscores. Duolingo, at the request of universities, has now started reporting subscores. Some institutions have already implemented subscore requirements (Western, Ottawa); others are publishing subscores for the next cycle, and there are some that have not yet decided to use subscores. Although we do not yet have reliable data on how students who have written the Duolingo are faring in their degree studies, in order to align with the standards of UW's other acceptable proficiency tests, requiring subscores for Duolingo, particularly in the areas of Literacy and Production, should be considered. For example, IELTS requirements are listed as 6.5 overall with 6.5 in writing and 6.5 in speaking and iBT (TOFEL) requirements are 90 overall with 25 in speaking and 25 in writing. Due to the importance of co-op and communications initiatives for first-year students at UW, subscores are valuable indicators.

The change to the admission requirements is for the fall 2024 admission cohort; requirements are listed in recruitment publications and websites, but not in the Undergraduate Studies Academic Calendar.

Admission Requirement Changes:

It is suggested that a subscore of 110 in both Literacy and Production be added to the pilot period of Duolingo test score acceptance.

2.3. Jurisdiction – Calendar Content

Effective date: September 1, 2024

Background and rationale: Beginning with the 2024-25 Undergraduate Studies Academic Calendar (USAC), all course delivery mode/format will be removed from the USAC. These scheduling-related details, which change more frequently than the USAC, will be more appropriately decided by instructors when designing their course offerings. As such, the mention of course delivery or format within some University jurisdictional text needs to be updated.

Page: [Calendar Academic Year/Home page](#)

Calendar Text:

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The University reserves the right to change without notice any information contained in this Calendar, including but not limited to that related to tuition and other fees, standards of admission, ~~course delivery or format~~, continuation of study, and the offering or requirements for the granting of degrees, diplomas, or certificates in any or all of its programs.

In these instances, the University of Waterloo shall make reasonable efforts to notify students of such changes as soon as practical.

2.4. Jurisdiction – Cancelling Scheduled Offerings

Effective date: September 1, 2024

Background and rationale: Once a course has been scheduled to be offered in a given term, it can be necessary to cancel that offering, for example, due to low enrolment. The Undergraduate Studies Academic Calendar (USAC) does not currently have an explicit statement regarding that the University can choose to cancel (and/or change) an offered course and what students can expect when this type of cancellation occurs. There are statements that are close to this concept, but there is a belief that there is a gap (discussed at Undergraduate Operations in March 2023). There already exists a well-established process with regards to cancelling a section or course when students are enrolled. The proposed addition to the text does not change any of the existing processes but allows individuals to point to the University’s authority to cancel an offering, if needed.

Page: University Jurisdiction

Calendar Text:

...

Access to Academic Programs, Plans, and Courses

The publication of this Calendar does not bind the University to the provision of courses, programs, schedules of study, or facilities as listed herein.

Practical or unforeseen circumstances, such as significant budget shortfalls or the unavailability of qualified personnel, may restrict the actual choices available to students when compared with those listed in the Calendar or in other University publications.

- The University reserves the right to limit access to, or to withdraw, courses or academic programs/plans; **the University also reserves the right to cancel and/or change scheduled offerings of a course.**
- In such circumstances the University will endeavour, to make reasonable efforts, to enable students to complete their degree requirements in a satisfactory manner.
- In the event that existing resources make it necessary to limit admission to an academic program or plan, the admission process will be based on competition for the spaces available.