DATE: Tuesday 9 June 2020  
TIME: 12:00 noon – 2:00 p.m.  
PLACE: Teams – See meeting invitation or contact the secretary

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## Open Session

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*material attached/to be distributed**  
“SEN-consent” to be recommended to Senate for approval (consent agenda)  
“SEN-regular” to be recommended to Senate for approval (regular agenda)  
“UGC” to be approved on behalf of Senate & sent to Senate for information

2 June 2020  
Rebecca Wickens  
Associate University Secretary
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 12 May 2020 Meeting
[in agenda order]

Present: Katherine Acheson, Veronica Austen, Carly Benson, Kofi Campbell, Matthew Casale, Benoit Charbonneau, Victoria Chu, Martin Cooke, Daniel Davison, Vivian Dayeh, David DeVidi (chair), Leann Ferries, Brendon Larson, Bruce MacVicar, Cathy Newell Kelly, Jeremy Pittman, Francis Poulain, Megan Town, Marlee Spafford, Cristina Vanin, Chris Vigna, Ina Wang, Rebecca Wickens (secretary), Richard Wikkerink

Resources & Guests: Blair Clarance, Jennifer Coghlin, Danielle Jeanneault, Amanda McKenzie, Jennifer Roberts Smith (3b), Alyssa Voigt

Absent: Rachel Almaw, Ayla Alves, Rachel Bruce *regrets

Organization of Meeting: David DeVidi took the chair, and Rebecca Wickens acted as secretary. The secretary advised that a quorum was present. The agenda was approved without formal motion. The chair reminded members of the protocols for discussion and voting via Teams.

1. DECLARATIONS OF CONFLICTS OF INTEREST
No conflicts of interest were declared.

2. APPROVAL OF THE 10 MARCH 2020 MINUTES AND BUSINESS ARISING
The minutes were accepted as distributed. Newell Kelly and Larson. Carried. There was no business arising.

3. CURRICULAR ITEMS FOR APPROVAL & INFORMATION

Applied Health Sciences. Following an overview, there was a motion to approve the submission on behalf of Senate. Ferries and Vigna. Carried.

Arts. Acheson took members through the new courses. There was a motion to approve the new courses on behalf of Senate. Acheson and Wang. Carried. Acheson spoke to the course changes and inactivations, including the rationales therefor. There was a motion to approve the course changes and inactivations on behalf of Senate. Acheson and Ferries. Carried.

Acheson presented the new Communication Arts and Design Practice Program, highlighting: the program brings together the existing areas of research and study in the department; it fills a gap in the faculty of arts, which currently does not have a communications major; the approach and focus are unique in Canada. Discussion included: the process for approval and whether it is necessary to update materials such as the CVs of faculty members; the feasibility of running a program with small class sizes in the budget constrained environment; anticipated enrollment; expected demand for co-op positions; other experiential learning opportunities; the availability of minors in this area. There was a motion to recommend the approval of this program to Senate. Acheson and Spafford. Carried.

Acheson provided an overview of the proposed, new specializations for students in Accounting and Financial Management, as well as the new communication design specialization proposed by the department of English Language and Literature. There was a motion to recommend the approval of these new plans to Senate. Acheson and Charbonneau. Carried.

Following a brief overview of the major modifications outlined in Section 5 of the submission, there was a motion to recommend the approval of these major modifications to Senate. Acheson and Campbell. Carried. There was a motion to approve the minor modifications outlined in Section 6 of the submission on behalf of Senate. Acheson and Spafford. Carried. There was a motion to recommend the approval of plan inactivations set forth in Section 7 of the submission to Senate. Acheson and Larson. Carried.
Acheson presented the proposed changes to co-operative education regulations re: transfer credits, work term reports and PD courses, as well as course preface notes in French studies. Wikkerink indicated that he and Acheson are having discussions regarding calendar text for the work term report section, but the outcome of that discussion will not impact the decision before council. There was a motion to recommend the approval of the regulations set forth in Section 8 of the submission to Senate. Acheson and Austen. Carried.

Acheson took members through the proposed articulation agreement with University of Essex, noting: it is a 3+2 agreement (outgoing); the agreement was initiated by St. Paul’s; honours arts students taking a human rights minor will be eligible for consideration. Discussion included: the pros and cons of this program for Waterloo; enrollment expectations; the origins of the agreement. Following discussion, there was a motion to recommend the approval by Senate of the admissions and progressions requirements outlined in the articulation agreement with the University of Essex. Acheson and Spafford. Carried with one abstention and one against.

**Environment.** Larson spoke to: a new course which was withdrawn at the February meeting pending consultation with arts; a revised course which is cross-listed with a course presented as part of the applied health sciences submission. There was a motion to approve the new and revised courses on behalf of Senate. Larson and Poulin. Carried.

**Mathematics.** Charbonneau presented a proposed, new course intended to help incoming students impacted by the closure of high schools due to COVID-19 to prepare for university-level mathematics, noting: approval by the Registrar’s Office for a 1 May 2020 effective date; intention that students be able to take the course in the summer or early fall; students in programs offered by other faculties with mathematics requirements will be able to enrol; the course will carry a 0.25 credit weight; there will be no additional cost if the student is enrolled in four courses; the course will not be mandatory; subject to approval, the academic and logistical details will be addressed at the mathematics planning committee. There was a motion to approve the course on behalf of Senate. Charbonneau and Wang. Carried.

Charbonneau gave an overview of the remaining new and revised courses, and minor modifications outlined in the mathematics submission. There was a motion to approve these items on behalf of Senate. Charbonneau and Poulin. Carried.

**Science.** Spafford presented the course changes (noting a minor typographical error in a course code in the rationale for CHEM 370) and the minor modification to the honours biology, microbiology specialization to correct an error in the 400-level course requirements. There was a motion to approve the course changes on behalf of Senate. Spafford and Charbonneau. Carried.

Spafford spoke to the major modification, indicating: it is related to the accounting and financial management changes approved as part of the submission from arts. Spafford presented the plan inactivations, noting that they are due to sustained low enrollment. There was a motion to recommend that Senate approve the major modification and plan inactivations as presented. Spafford and Acheson. Carried.

**Renison University College.** Campbell spoke to: the request to rescind previously approved changes to SWREN courses that are cross-listed with SDS courses following consultation with SDS; changes to SWREN courses cross-listed with arts courses, which were revised under the arts submission. There was a motion to approve the course changes and request to rescind previous changes on behalf of Senate. Campbell and Acheson. Carried.

Campbell spoke to the proposed minor modifications to the bachelor of social work, including pathways into the program and calendar language related thereto. There was a motion to approve the minor modifications on behalf of Senate. Campbell and Ferries. Carried.
Decision-Making Process for Adjustments for Spring-Fall 2020. The chair spoke to the document, highlighting: the research and consultation leading to its development; the intention to give members an opportunity to review, comment and vote on the recommendation after the meeting. In response to questions, the chair clarified that the process described in the document is already used for temporary changes; council will receive an update on temporary changes approved in spring-fall 2020 (similar to item 4b). Members discussed the need, long-term, for greater consideration of the academic mission in the emergency response plan.

4. Registrar’s Office
Effective Dates 2020-2021. This report was received for information.

Summary of Winter 2020 Faculty Rule Changes. Newell Kelly presented the report, highlighting: the consultation process and temporary changes made to assist students impacted by the pandemic in Winter 2020; changes with effect beyond Winter 2020 which require approval. Following a clarification of the changes to the term dean’s honours list for mathematics and 50% rule, there was a motion to recommend the approval of items 3 and 7 of the report to Senate.

5. Other Business.
There was no other business.

6. NEXT MEETING
The next meeting is scheduled for Tuesday 9 June 2020, 12:00 noon to 2:00 p.m. via Teams.

2 June 2020

Rebecca Wickens
Associate University Secretary
TO: Rebecca Wickens, Associate University Secretary, Secretariat

FROM: Dan Davison, Associate Dean, Undergraduate Studies, Faculty of Engineering

SUBJECT: Items for Approval June 9, 2020 Senate Undergraduate Council

1. New Courses
   - Chemical Engineering
     (Civil and Environmental Engineering) Architectural Engineering

2. Course Changes
   - Chemical Engineering
     (Civil and Environmental Engineering) Architectural Engineering

3. Course Inactivations
   - Chemical Engineering

4. Academic Plans (Minor Modifications)
   4.1 Chemical Engineering
   4.2 (Civil and Environmental Engineering) Architectural Engineering
NEW COURSES  (for approval)

Chemical Engineering

Effective  01-SEP-2021
CHE  520 ( 0.50 )  LEC, TUT  Process Flowsheet Analysis
An integrated view of process flowsheet synthesis, analysis and optimization, emphasizing the use of computer aids to perform steady-state mass and energy balancing on chemical processes. Application of relevant chemical engineering concepts, including mass and energy balances, thermodynamics of mixtures and unit operation models, to process simulation. Process simulation modes, numerical solution of relevant non-linear equation systems, recycle partitioning, and tearing. Applications including heat exchanger networks, multitage separation processes, and chemical reactor networks. Practical skills will be developed through the application of available process simulation software. [Offered: W]

Requisites :
Prereq: Level 4B Chemical Engineering

Rationale :
This new course strengthens an important area of application of chemical engineering, namely process systems engineering (PSE). As a technical elective, this course will be of interest to undergraduate students seeking a deeper understanding of the tools and techniques employed in the simulation of chemical process flowsheets. This course, which is accessible to chemical engineering graduate students, is also part of the MEng PSE specialization.

Effective  01-SEP-2021
CHE  521 ( 0.50 )  LEC  Process Optimization

Requisites :
Prereq: Level at least 3B Chemical Engineering. Antireq: BME 411, MSCI 331, SYDE 411

Rationale :
This new course adds a technical elective in process optimization with a distinct focus on chemical engineering processes. This course, which is accessible to chemical engineering graduate students, is also part of the MEng PSE specialization. CHE 521 overlaps extensively with BME 411, MSCI 331, and SYDE 411, and for this reason they are acknowledged as an antirequisites. For students enrolled in the Management Sciences Option,
CHE 521 should be considered equivalent to MSCI 331 as far as the requirements. Management Engineering is bringing the MSCI option with this addition to October SUC.

Civil and Environmental Engineering

Effective 01-SEP-2021

AE 377 (0.50) LEC, TUT Structural Timber Design
An introduction to the behaviour of wood as an engineering material and design of timber structures based on limit states design principles. Topics include materials behaviour, selection and design of structural timber members and systems, including beams, joists, columns, connections, shearwalls, and diaphragms. [Offered: S]

Requisites: Prereq: Level at least 2B Architectural Engineering or Architecture students.

Rationale: This new course is different from ARCH 277, which it will replace in the AE plan. It will be offered to Architectural Engineering students as the first in their sequence of structural design courses, which means we will have to take some time (1-2 weeks) at the beginning to review basic concepts of limit states design. This new course will benefit the students and support accreditation, as it will make it much easier for the course to be taught by a full time lecturer or tenure track faculty member with a PEng. The School of Architecture will be inactivating ARCH 277 in the next Calendar cycle. (note: no final exam, but this course will have 2 quizzes, and one project)

COURSE CHANGES (for approval)

Chemical Engineering

Current Catalog Information

CHE 101 (0.50) LAB, LEC, TST, TUT Chemical Engineering Concepts 2
Development of chemical process analysis skills. Introduction to single- and multi-phase physical equilibria. Material and energy balances in reactive and non-reactive systems. Introduction to investigation and technical communication through laboratory experiments illustrating the physical principles discussed. (In the Winter term only: brief review of co-op fundamentals.) [Offered: W, S]

Requisites: No Special Consent Required

Effective 01-SEP-2021

Requisite Change: Prereq: CHE 100; Level at least 1B Chemical Engineering

Rationale: The core course CHE 100 is removed from the prerequisites as it is redundant.
Current Catalog Information
CHE  102  ( 0.50 )  LEC, TST, TUT  Chemistry for Engineers
Chemical principles with applications in engineering. Stoichiometric calculations, properties of gases, properties of liquids and solutions, gas phase chemical equilibrium, ionic equilibrium in aqueous solution, oxidation-reduction reactions, chemical kinetics. [Offered: F]
No Special Consent Required
Prerequisites: Prereq: Open only to students in Chemical, Civil, Computer, Electrical, Environmental, Geographical, Management, Mechanical, Mechatronics and Software Engineering
Effective  01-SEP-2021
Course Attribute Change: Also offered Online
Rationale: The classroom version of CHE 102 has been and will continue to be offered in the fall term to incoming 1A engineering students and in the spring term to students in the recovery program. An online version of this course is also in place and will be accessible to students who are not block-enrolled in the classroom version. The prerequisites are removed as they are redundant. Chemical Engineering will schedule reserves for on campus and online. First-year students are first block-enrolled, so if spots are open other students (upper-year students who failed this course) can take it. If the spots run out, students would need a course override form approved from the department to get in.

Current Catalog Information
CHE  180  ( 0.50 )  LEC, SEM, STU  Chemical Engineering Design Studio 1
No Special Consent Required
Requisites:

Effective 01-SEP-2021

Prereq: 1A Chemical Engineering

Description Change:


Rationale:
The design project undertaken in CHE 180 is not continued in CHE 181. The description is updated to reflect this information.

Current Catalog Information

CHE 181 (0.50) LEC, SEM, STU Chemical Engineering Design Studio 2


No Special Consent Required

Requisites:

Effective 01-SEP-2021

Prereq: Level at least 1B Chemical Engineering

Description Change:

Communication of technical information, written reports and oral presentations. Teamwork. Students undertake a term-long design project under the supervision of the instructor. [Offered: W,S]

Rationale: The design project undertaken in CHE 181 is not a continuation of the one undertaken in CHE 180. The course description is updated to reflect this.

**Current Catalog Information**

**CHE 425 (0.50) LEC, TUT**

Strategies for Process Improvement and Product Development

A course in practical statistics at a level one step beyond an elementary course.

Material includes regression analysis for linear and nonlinear models, analysis of variance, statistical inference, single and multiple comparisons, and an introduction to the design of experiments including single factor designs, multifactor designs, response surface methods, d-optimality (with empirical and mechanistic models), and the analysis of undesigned data. Applications to process improvement, product development and research problems will be explored. Use of statistical analysis software to apply these techniques. [Offered: F, W]

No Special Consent Required

**Effective 01-SEP-2021**

Subject/Catalog Nbr Change: **CHE 225**

Unit Change: (0.50)

Title Change: Strategies for Process Improvement and Product Development

Description Change: A course in practical statistics at a level one step beyond an elementary course. Material includes regression analysis for linear and nonlinear models, analysis of variance, statistical inference, single and multiple comparisons, and an introduction to the design of experiments including single factor designs, multifactor designs, response surface methods, d-optimality (with empirical and mechanistic models), and the analysis of undesigned data. Applications to process improvement, product development and research problems will be explored. Use of statistical analysis software to apply these techniques. [Offered: F, W, S, first offered spring 2022 as CHE 225; last offered as CHE 425 winter 2024]

Requisite Change: Prereq: Level at least 2B Chemical Engineering

New Cross Listing: **CHE 425**

Rationale: This is the second statistics course, previously offered as CHE 425 (and prior to 2015 as CHE 325 in the 3B term). This course is best taught in 2B for a variety of reasons. Firstly, proximity to CHE 220 (2A) establishes the continuity of statistics concepts, reinforcing learning and optimizing content delivery. Secondly, concepts related to design of experiments are needed in the laboratory course CHE 390 taken in the 3A term. Thirdly, the knowledge and skills developed in CHE 225 are sought after by employers, so it is advantageous for the students to acquire them as early as possible. The antirequisite for CHE 425 is removed as it is an earlier offering of the same course (CHE 325) in the 3B term and is no longer needed.

CHE 225 is cross-listed with CHE 425. CHE 425 will continue to be taught to upper year students who entered 1A in 2019 until winter 2024. The
department will flag this course for inactivation at a later date. CHE 225 will begin to be taught to 2B students who entered 1A in 2020, beginning in spring 2022. So essentially for a little while the course will be taught to 2 cohorts until winter 2024.

Current Catalog Information
CHE 322 (0.50) LEC, TUT Numerical Methods for Process Analysis and Design
Systems of linear and non-linear algebraic equations; polynomial and spline interpolation; numerical differentiation and integration; numerical solution of initial value and boundary value ordinary differential equation problems: accuracy and stability, step size control and stiffness; finite differences for the numerical solution of elliptic and parabolic partial differential equations: method of lines, explicit vs. implicit finite-difference methods; introduction to the finite element method (optional). The course extends material on numerical methods and their implementation in Matlab, covered in CHE 121, to address a variety of models of chemical engineering processes. [Offered: W, S]
Requisites: Prereq: 3A Chemical Engineering
Effective 01-SEP-2021
Description Change: Systems of linear and non-linear algebraic equations; polynomial and spline interpolation; numerical differentiation and integration; numerical solution of initial value and boundary value ordinary differential equation problems: accuracy and stability, step size control and stiffness; finite differences for the numerical solution of elliptic and parabolic partial differential equations: method of lines, explicit vs. implicit finite-difference methods; introduction to the finite element method (optional). [Offered: W, S]
Rationale: Numerical methods material is contained entirely in CHE 322. CHE 121 has been inactivated. The course description is updated to reflect this.

Current Catalog Information
CHE 425 (0.50) LEC, TUT Strategies for Process Improvement and Product Development
A course in practical statistics at a level one step beyond an elementary course. Material includes regression analysis for linear and nonlinear models, analysis of variance, statistical inference, single and multiple comparisons, and an introduction to the design of experiments including single factor designs, multifactor designs, response surface methods, d-optimality (with empirical and mechanistic models), and the analysis of undesigned data. Applications to process improvement, product development and research problems will be explored. Use of statistical analysis software to apply these techniques. [Offered: F, W]
Requisites: Prereq: Level at least 3B Chemical Engineering. Antireq: CHE 325
Effective 01-SEP-2021
Subject/Catalog Nbr Change: CHE 425
Unit Change: (0.50)
Title Change: Strategies for Process Improvement and Product Development
Description Change: A course in practical statistics at a level one step beyond an elementary course. Material includes regression analysis for linear and nonlinear models, analysis of variance, statistical inference, single and multiple comparisons, and an introduction to the design of experiments including single factor designs, multifactor designs, response surface methods, d-optimality (with empirical and mechanistic models), and the analysis of undesigned data. Applications to process improvement, product development and research problems will be explored. Use of statistical analysis software to apply these techniques. [Offered: F, W, S, first offered spring 2022 as CHE 225; last offered as CHE 425 winter 2024]

Requisite Change: Prereq: Level at least 3B Chemical Engineering
New Cross Listing: CHE 225
Rationale: This is the second statistics course, previously offered as CHE 425 (and prior to 2015 as CHE 325 in the 3B term). This course is best taught in 2B for a variety of reasons. Firstly, proximity to CHE 220 (2A) establishes the continuity of statistics concepts, reinforcing learning and optimizing content delivery. Secondly, concepts related to design of experiments are needed in the laboratory course CHE 390 taken in the 3A term. Thirdly, the knowledge and skills developed in CHE 225 are sought after by employers, so it is advantageous for the students to acquire them as early as possible. The antirequisite for CHE 425 is removed as it is an earlier offering of the same course (CHE 325) in the 3B term and is no longer needed.

CHE 225 is cross-listed with CHE 425. CHE 425 will continue to be taught to upper year students who entered 1A in 2019 until winter 2024. The department will flag this course for inactivation at a later date. CHE 225 will begin to be taught to 2B students who entered 1A in 2020, beginning in spring 2022. So essentially for a little while the course will be taught to 2 cohorts until winter 2024.

Current Catalog Information
CHE 480 (0.50) LEC, TUT Process Analysis and Design
Development and analysis of process flowsheets and chemical product design. Design and selection of common process equipment such as heat exchangers, pumps, piping, staged separations. Incorporation of pollution prevention and inherently safer design principles. Equipment and project cost estimation. [Offered: F, S]
No Special Consent Required
Requisites: Prereq: 4A Chemical Engineering
Effective 01-SEP-2021

Description Change: Development and analysis of process flowsheets and chemical product design. Design and selection of common process equipment such as heat exchangers, pumps, piping, staged separations. Incorporation of pollution prevention and inherently safer design principles. Equipment and project cost estimation. [Offered: F]

Rationale: The 4A term is a fall term course for both stream-4 and stream-8 students.
CHE 480 is only offered in the fall term.

**Current Catalog Information**

**CHE 482 (0.50)** PRJ, SEM Group Design Project

The first of two required courses for the Chemical Engineering capstone design project. Student design teams of two to four members work on design projects of industrial scope and importance under the mentorship of a faculty member. Students develop and communicate a feasible design project proposal and plan; generate feasible solutions that address the formulated problem; evaluate alternatives and identify preferred solution; address safety, regulatory, sustainability and professional ethics requirements, as appropriate; effectively manage design project technical and non-technical risks using project management tools and techniques; deliver a report and/or a presentation that summarizes the work completed; work effectively as a team member and/or team leader. [Offered: F]

No Special Consent Required

Requisites:

Prereq: 4A Chemical Engineering

**Effective 02-SEP-2021**

**Rationale:**

The course description is updated; student design teams now comprise three to five members, instead of two to four students. This change is made to reflect actual practice. [sarecord note that there was already a row for September 1, 2021]

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**Current Catalog Information**

**CHE 500 (0.50)** LEC Special Topics in Chemical Engineering

Special courses on advanced topics may be offered from time to time, when resources are available. For current offerings, inquire at the CHE undergraduate office.

No Special Consent Required

Requisites:

Prereq: Level at least 4A Chemical Engineering

**Effective 01-SEP-2021**

**Requisite Change:**

Prereq: Level at least 3B Chemical Engineering

**Rationale:**

Since Chemical Engineering students can take a technical elective in their 3B term, modification of the prerequisite is needed to facilitate access to technical electives offered from time to time.
CHE  543  ( 0.50 )  LEC  Polymer Production: Polymer Reaction Engineering

Overview of polymer production technology and polymer reaction engineering analysis tools. Examples from chain growth polymerization processes (free radical, ionic, living/controlled radical variants, metal co-ordination catalysis, etc.), different modes of polymer reactor operation (batch, semi-batch, continuous flow stirred-tank reactor (CSTR), tubular, trains of CSTRs), homogeneous (bulk/solution/suspension) and heterogeneous (emulsion/displacement/co-ordinated/etc.), linear and branched/cross-linked chains. Calculations and mathematical models for rate, copolymer composition, molecular weight and sequence length characteristics, for polymer reactor design/optimization of polymer productivity and quality variables.

[Offered: W]
No Special Consent Required

Requisites:
Prereq: Level at least 3B Chemical Engineering

Effective  01-SEP-2021
Requisite Change :
Prereq: CHE 541
Rationale :
The material taught in CHE 541 builds the foundation on polymer science that supports the content of CHE 543. The presence in CHE 543 of students lacking this background prevents the instructor from delivering the course as intended, and they end up spending too much time reviewing CHE 541 content. The prerequisite is updated to reflect this.

Current Catalog Information
( 0.00 )

Effective  01-SEP-2021
Subject/Catalog Nbr Change:  CHE  561
Unit Change:  ( 0.50 )
Title Change:  Biomaterials and Biomedical Design

Requisite Change :
Prereq: Level at least 3B Chemical Engineering. Antireq: BME 489 (Topic 1: Biocompatibility and Biomaterial)
New Cross Listing :  NE  488
Rationale :
This is the same course as Nanotechnology Engineering technical elective NE 488, and now cross-listed. Biomedical Engineering technical elective BME 489 is added as an antirequisite. The Department of Chemical Engineering offers NE488/BME489 regularly and availability of CHE 561 will facilitate access of interested chemical engineering students to this interdisciplinary technical elective (note that chemical engineering students are required to take 2 chemical engineering technical electives). This includes MASc and MEng students who will be able to count CHE 561
towards their degree requirements.

Civil and Environmental Engineering

Current Catalog Information
AE 100  ( 0.50 )  LEC, STU, TUT  Concepts Studio
An introduction to the fundamental engineering methods, principles and skills, design and communication in architectural engineering. Scale models of historically significant buildings, bridges, and towers will be hand built and hand drawn. Simple design projects will be used to develop and understand the design process and construction drawings and specifications. Introduction to computer analysis tools (Excel, Matlab) and the profession. [Offered: F]
No Special Consent Required
Requisites :  Prereq: 1A Architectural Engineering

Effective 01-SEP-2021
Description Change: An introduction to the fundamental engineering methods, principles and skills, design and communication in architectural engineering. Techniques in analytical sketching, orthographic drawing, construction documentation, problem definition, and scaled model building will underlie the collaborative development of (a) small-scale design project(s). Students will become familiar with the language and anatomy of buildings, the studio environment and culture of peer evaluation and juried work critique, and the fundamental conventions of design. Introduction to report writing, documentation, and fundamental two-dimensional computer-aided design (2D CAD) software and tools. [Offered: F]
Rationale : The course description is revised to better reflect how the course is being taught. It was determined that the inclusion of sketching and two-dimensional computer-aided design (2D CAD) software in the 1A studio course would be critical. This addition gives the 1A Architectural Engineering students the skills that will make them immediately hireable as co-op students.

Current Catalog Information
AE 101  ( 0.50 )  LEC, STU, TST  History of the Built Environment
A complementary studies course that provides a broad history of technology as it relates to buildings, towers, bridges, etc. Social, cultural, and economic influences on technological products will be discussed while surveying icons of architectural engineering. [Offered: F]
No Special Consent Required
Requisites :  Prereq: 1A Architectural Engineering

Effective 01-SEP-2021
Requisite Change :
Rationale : The prerequisites are removed to enable us to open this course up as a complementary studies elective to a limited number of non-Architectural Engineering students as a service-teaching task for the School of
Architecture. If there is sufficient interest, it may be split into two sections in the future; one, which would be limited to the Architectural Engineering class, and another, which will be open to other students.

Current Catalog Information

AE 125  (0.50)  LEC, STU, TUT  Architectural Graphics Studio
Basic hand- and computer-sketching techniques, perspective, isometrics, presentation graphics, working drawings, and contract documents. Exposure to computer-based drafting, rendering, and solid modelling tools. Drawing as a design and analysis (sun shading, structural forces) tool. [Offered: S]
No Special Consent Required
Requisites:
Prereq: AE 100; Level at least 1B Architectural Engineering

Effective 01-SEP-2021
Title Change: Structural Design Studio
Description Change: Development of design and communication skills through application in projects involving various building/bridge types. The role of structure in the built environment is explored, including issues of materiality and technology. Exposure to three-dimensional (3D) modelling and model building. [Offered: S]
Rationale:
The course description and title are revised to reflect how this course is being taught. It was determined that the inclusion of sketching and (2D CAD) two-dimensional computer-aided design software in the 1A studio course would be critical. This addition gives the 1A Architectural Engineering students the skills that will make them immediately hireable as co-op students.

Current Catalog Information

AE 200  (0.50)  LEC, STU, TUT  Structural Design Studio
Development of design and communication skills through application in projects involving various building/bridge types. Emphasis placed upon issues of materiality and technology in structural and building design. Form finding, model building. [Offered: W]
No Special Consent Required
Requisites:
Prereq: AE 125; Level at least 2A Architectural Engineering

Effective 01-SEP-2021
Title Change: Enclosure Design Studio
Description Change: Development of design and communication expertise through studio projects involving various building enclosure types. Exposure to building enclosure materials, systems, applications, and methods of representation. Emphasis placed on critical evaluation, problem solving, and design synthesis. Introduction to industry standard three-dimensional computer-aided design (3D CAD) software. [Offered: W]
Rationale:
With the elimination of the 1B graphics-focused studio, a rework of the first four studio courses has been performed. This has included the development of a steady and logical progression of exposure to graphical communication skills and software in the first three studio courses,
including: hand drafting and two-dimensional computer-aided design (2D CAD) (e.g. AutoCAD) in 1A (AE 100), three dimensional (3D) modelling software (e.g. Rhino) in 1B (AE 125), and industry three-dimensional computer-aided design (3D CAD) software (a.k.a. building information modelling or BIM software, e.g. REVIT) in 2A (AE 200). In addition to this change to the graphics delivery, a logical progression in the focus of the studio projects has been developed in the first four studio courses, with the introduction to studio theme maintained in 1A (AE 100) and the 1B-2B studio courses now each focusing on the following: the building "bones" or structure in AE 125, the building "skin" or envelope in AE 200, and the building "organs" or systems in AE 225. These themes are delivered in this order so that the studio courses align as well as possible with the sequence of the other courses being delivered to the students during the first four academic terms of the program. These three calendar descriptions have been modified accordingly.

**Current Catalog Information**

**AE 225 (0.50) LEC, STU, TUT**

Environmental Building Studio

Environmental performance of buildings studied via physical investigations, demonstrations, case studies, design exercises. Relative roles of structure, enclosure, mechanical systems, embodied energy, life-cycle implications investigated.

[Offered: F]

No Special Consent Required

**Effective 01-SEP-2021**

**Title Change:** Environmental Building Systems Studio

**Description Change:** Environmental performance of buildings studied via physical investigations, demonstrations, case studies, and design exercises with a focus on building mechanical and electrical systems and lighting. Embodied energy, and life-cycle implications will be introduced. [Offered: F]

**Rationale:**

With the elimination of the 1B graphics-focused studio, a rework of the first four studio courses has been performed. This has included the development of a steady and logical progression of exposure to graphical communication skills and software in the first three studio courses, including: hand drafting and two-dimensional computer-aided design (2D CAD) (e.g. AutoCAD) in 1A (AE 100), three dimensional (3D) modelling software (e.g. Rhino) in 1B (AE 125), and industry three-dimensional computer-aided design (3D CAD) software (a.k.a. building information modelling or BIM software, e.g. REVIT) in 2A (AE 200). In addition to this change to the graphics delivery, a logical progression in the focus of the studio projects has been developed in the first four studio courses, with the introduction to studio theme maintained in 1A (AE 100) and the 1B-2B studio courses now each focusing on the following: the building "bones" or structure in AE 125, the building "skin" or envelope in AE 200, and the building "organs" or systems in AE 225. These themes are delivered in this order so that the studio courses align as well as possible with the
sequence of the other courses being delivered to the students during the first four academic terms of the program. These three calendar descriptions have been modified accordingly.

**Current Catalog Information**

**AE 279 (0.50) LEC, TST, TUT**  
**Energy and the Environment**

Conservation of energy, energy balances on closed systems. Steady-state and transient heat transfer via convection, radiation, and conduction. Mechanical and electrical work. Internal energy, enthalpy, and specific heats of solids, liquids, and gases. Phase change in natural environmental systems; the basics of heat engines, refrigerators, and heat pumps. Function, evaluation, and design of energy resource technology: wind and hydroelectric turbines, photovoltaics, geothermal energy, biomass and biofuel, natural gas and petroleum extraction, and tidal energy. Renewable energy policy and implications. [Offered: S, first offered Spring 2021]

No Special Consent Required

Requisites:

Prereq: Level at least 2B Architectural, Civil, Environmental, or Geological Engineering. Antireq: BME 384, CHE 330, ECE 309/MTE 309, ENVE 279, ME 250, SYDE 381

Effective 01-SEP-2021


Rationale:

The AE 279 and 280 calendar descriptions are being revised for two reasons: 1) it has been realized that the content in AE 280 (which is actually taken before AE 279) is too much to be covered in sufficient depth in one course, so some of this content will be moved to AE 279, and 2) the previous calendar description for AE 279 was based heavily on the ENVE 279 description, and includes a lot of detail on energy sources, which will not be covered with the same emphasis in the AE version of this course, which will focus more on topics more relevant to buildings and building design.

**Current Catalog Information**

**AE 280 (0.50) LAB, LEC, TST, TUT**  
**Fluid Mechanics and Thermal Sciences**


No Special Consent Required

Requisites:

Prereq: CIVE 105, 221; Level at least 2A Architectural or Civil Engineering. Antireq: CIVE 280, ENVE 280

Effective 01-SEP-2021

Rationale: The AE 279 and 280 calendar descriptions are being revised for two reasons: 1) it has been realized that the content in AE 280 (which is actually taken before AE 279) is too much to be covered in sufficient depth in one course, so some of this content will be moved to AE 279, and 2) the previous calendar description for AE 279 was based heavily on the ENVE 279 description, and includes a lot of detail on energy sources, which will not be covered with the same emphasis in the AE version of this course, which will focus more on topics more relevant to buildings and building design.

COURSE INACTIVATIONS (for approval)

Chemical Engineering

Effective 01-SEP-2021
CHE 391 (0.25) Chemical Engineering Lab 4
Rationale: This course is no longer part of the Chemical Engineering curriculum. Its last offering is winter 2020.

Effective 01-SEP-2021
CHE 420 (0.50) Introduction to Process Control
Rationale: This course is no longer part of the Chemical Engineering curriculum (replaced with CHE 341). Its last offering is fall 2020.
4. ACADEMIC PLANS – MINOR MODIFICATIONS

4.1 Chemical Engineering

4.1.1 Calendar Changes

Effective Date: September 1, 2021

Background and Rationale:

CHE 225 approved earlier in this agenda, is placed in the 2B term as a new course. It is cross-listed with CHE 425 which will eventually be inactivated. Other courses have moved terms of offering in order to accommodate CHE 225 in the 2B term. For example, MSCI 261 is moving to 3A.

### CALENDAR MARK UP

#### Chemical Engineering

#### Academic Curriculum

<table>
<thead>
<tr>
<th>Term</th>
<th>Course</th>
<th>Title and Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2B Spring(^8) and Fall(^4)</td>
<td>CHE 211</td>
<td>Fluid Mechanics (3 LEC, 1 TUT)</td>
</tr>
<tr>
<td></td>
<td>CHE 225</td>
<td><strong>Strategies for Process Improvement and Product Development</strong> (3 LEC, 1 TUT)</td>
</tr>
<tr>
<td></td>
<td>CHE 231</td>
<td>Physical Chemistry 2 (3 LEC, 1 TUT)</td>
</tr>
<tr>
<td></td>
<td>CHE 241</td>
<td>Materials Science and Engineering (3 LEC, 1 TUT)</td>
</tr>
<tr>
<td></td>
<td>CHE 291</td>
<td>Chemical Engineering Lab 2 (3 LAB)</td>
</tr>
<tr>
<td></td>
<td>MATH 218</td>
<td>Differential Equations for Engineers (3 LEC, 1 TUT)</td>
</tr>
<tr>
<td></td>
<td>MSCI 261</td>
<td>Engineering Economics: Financial Management for Engineers (3 LEC, 1 TUT)</td>
</tr>
<tr>
<td></td>
<td>CHE 299</td>
<td>Directed Research Project (6 PRJ) (optional extra)</td>
</tr>
</tbody>
</table>
4.1.2 Technical Electives

Effective Date: September 1, 2021

Background and Rationale:
Process Systems Engineering (PSE) is a key area of application of chemical engineering. Technical electives CHE 520 and CHE 521, which focus uniquely on chemical processes, strengthen the curriculum in this area and increase the preparation and competitiveness of a significant group of ChE graduates. Par excellence interdisciplinary, technical elective CHE 561 prepares interested ChE students for work or further study in the areas of nanobiomedical materials and synthetic biology.

Chemical Engineering is modifying its Technical Elective lists to accommodate new courses created earlier in this agenda.

List 1 – Energy & Environmental Systems and Processes
- Add CHE 520

List 2 – Materials & Manufacturing Processes
- Add CHE 520 and 561

List 3 – Chemical Process Modelling Optimization & Control
- Add CHE 520 and 521
- Remove MSCI 331 (replaced by CHE 521)
levels that CHE students should be enrolled in before attempting a given course. Variations from this course selection list must be approved by the Department.

**List 1 - Energy and Environmental Systems and Processes**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title and Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 499</td>
<td>Elective Research Project (3B)</td>
</tr>
<tr>
<td>CHE 500</td>
<td>Special Topics in Chemical Engineering (contact Department)</td>
</tr>
<tr>
<td>CHE 514</td>
<td>Fundamentals of Petroleum Production (3B)</td>
</tr>
<tr>
<td>CHE 516</td>
<td>Energy Systems Engineering (3B)</td>
</tr>
<tr>
<td>CHE 520</td>
<td><strong>Process Flowsheet Analysis (4B)</strong></td>
</tr>
<tr>
<td>CHE 571</td>
<td>Industrial Ecology (3B)</td>
</tr>
<tr>
<td>CHE 572</td>
<td>Air Pollution Control (3B)</td>
</tr>
<tr>
<td>CHE 574</td>
<td>Industrial Wastewater Pollution Control (3B)</td>
</tr>
<tr>
<td>EARTH 458</td>
<td>Physical Hydrogeology (4A)</td>
</tr>
<tr>
<td>EARTH 459</td>
<td>Chemical Hydrogeology (4B)</td>
</tr>
<tr>
<td>ENVE 376</td>
<td>Biological Processes (3B)</td>
</tr>
<tr>
<td>ENVE 573</td>
<td>Contaminant Transport (4B)</td>
</tr>
<tr>
<td>ENVE 577</td>
<td>Engineering for Solid Waste Management (4B)</td>
</tr>
<tr>
<td>ME 452</td>
<td>Energy Transfer in Buildings (4B)</td>
</tr>
<tr>
<td>ME 459</td>
<td>Energy Conversion (3B)</td>
</tr>
<tr>
<td>ME 571</td>
<td>Air Pollution (4B)</td>
</tr>
</tbody>
</table>

**List 2 - Materials and Manufacturing Processes**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title and Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 499</td>
<td>Elective Research Project (3B)</td>
</tr>
<tr>
<td>CHE 500</td>
<td>Special Topics in Chemical Engineering (contact Department)</td>
</tr>
<tr>
<td>CHE 520</td>
<td><strong>Process Flowsheet Analysis (4B)</strong></td>
</tr>
<tr>
<td>CHE 541</td>
<td>Introduction to Polymer Science and Properties (3B)</td>
</tr>
<tr>
<td>CHE 543</td>
<td>Polymer Production: Polymer Reaction Engineering (4B)</td>
</tr>
<tr>
<td>CHE 561</td>
<td><strong>Biomaterials and Biomedical Design (4B)</strong></td>
</tr>
<tr>
<td>CHE 562</td>
<td>Advanced Bioprocess Engineering (4B)</td>
</tr>
<tr>
<td>CHE 564</td>
<td>Food Process Engineering (4B)</td>
</tr>
<tr>
<td>CHE 571</td>
<td>Industrial Ecology (3B)</td>
</tr>
<tr>
<td>ME 435</td>
<td>Industrial Metallurgy (4A)</td>
</tr>
<tr>
<td>ME 531</td>
<td>Physical Metallurgy Applied to Manufacturing (4B)</td>
</tr>
<tr>
<td>ME 533</td>
<td>Non-metallic and Composite Materials (4B)</td>
</tr>
<tr>
<td>MSCI 432</td>
<td>Production and Service Operations Management (3B)</td>
</tr>
<tr>
<td>MSCI 551</td>
<td>Quality Management and Control (3B)</td>
</tr>
<tr>
<td>NE 352</td>
<td>Surfaces and Interfaces (4A)</td>
</tr>
<tr>
<td>NE 481</td>
<td>Nanomedicine and Nanobiotechnology (4A)</td>
</tr>
</tbody>
</table>
### List 3 - Chemical Process Modelling, Optimization, and Control

<table>
<thead>
<tr>
<th>Course</th>
<th>Title and Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 499</td>
<td>Elective Research Project (3B)</td>
</tr>
<tr>
<td>CHE 500</td>
<td>Special Topics in Chemical Engineering (contact Department)</td>
</tr>
<tr>
<td>CHE 520</td>
<td><strong>Process Flowsheet Analysis (4B)</strong></td>
</tr>
<tr>
<td>CHE 521</td>
<td><strong>Process Optimization (3B)</strong></td>
</tr>
<tr>
<td>CHE 522</td>
<td>Advanced Process Dynamics and Control (4B)</td>
</tr>
<tr>
<td>CHE 524</td>
<td>Process Control Laboratory (4B)</td>
</tr>
<tr>
<td>EARTH 456</td>
<td>Numerical Methods in Hydrogeology (4A)</td>
</tr>
<tr>
<td>ME 362</td>
<td>Fluid Mechanics 2 (3B)</td>
</tr>
<tr>
<td>ME 559</td>
<td>Finite Element Methods (3B)</td>
</tr>
<tr>
<td>ME 566</td>
<td>Computational Fluid Dynamics for Engineering Design (4A)</td>
</tr>
<tr>
<td>MSCI 331</td>
<td><strong>Introduction to Optimization (3B)</strong></td>
</tr>
<tr>
<td>MSCI 332</td>
<td>Deterministic Optimization Models and Methods (3B)</td>
</tr>
<tr>
<td>MSCI 431</td>
<td>Stochastic Models and Methods (4B)</td>
</tr>
<tr>
<td>MSCI 432</td>
<td>Production and Service Operations Management (3B)</td>
</tr>
<tr>
<td>MSCI 551</td>
<td>Quality Management and Control (3B)</td>
</tr>
<tr>
<td>NE 451</td>
<td>Simulation Methods (4A)</td>
</tr>
<tr>
<td>SYDE 531</td>
<td>Design Optimization Under Probabilistic Uncertainty (4B)</td>
</tr>
</tbody>
</table>

All undergraduate course descriptions including [Chemical Engineering](#) can be found in the Course Descriptions section of this Calendar.
4.2 (Civil and Environmental Engineering) Architectural Engineering

Effective Date: September 1, 2021

Background and Rationale: Architectural Engineering has created a new course AE 377 to replace ARCH 277 in the plan. This change will give the AE program more flexibility in who teaches it. As an ARCH course, it could only be taught by an ARCH professor. This possibility has been discussed with the School of Architecture, and it has been agreed that if this course is taught by a CEE professor, then it will be traded for another teaching task so that the number of ARCH AE teaching tasks is maintained.

CALENDAR MARK UP

Architectural Engineering

Academic Curriculum

The following curriculum is applicable to students entering Architectural Engineering in the fall 2020 term. Note that a total of two approved Complementary Studies Electives (CSE), in addition to ENGL 191/SPCOM 191, AE 101, AE 392, and AE 491, and eight approved Technical Electives (TE) must be completed as detailed in the following sections.

Legend

* Must be a Technical Elective (TE) if Complementary Studies Elective (CSE) is selected in a previous term, and vice versa.

Term 1A (Fall)

AE 100 Concepts Studio
AE 101 History of the Built Environment (List C-Humanities and Social Sciences CSE)
AE 104 Mechanics 1
AE 115 Linear Algebra
CHE 102 Chemistry for Engineers
MATH 116 Calculus 1 for Engineering
Term 1B (Spring)

AE 105  Mechanics 2
AE 121  Computational Methods
AE 123  Electrical Circuits and Instrumentation
AE 125  Architectural Graphics  Structural Design  Studio
AE 199  Seminar
MATH 118  Calculus 2 for Engineering

Term 2A (Winter)

AE 200  Structural Enclosure  Design Studio
AE 204  Solid Mechanics 1
AE 221  Advanced Calculus
AE 224  Probability and Statistics
AE 280  Fluid Mechanics and Thermal Sciences
AE 298  Seminar
ENGL 191/SPCOM 191  Communication in the Engineering Profession (List D-Other CSE)

Term 2B (Fall)

AE 205  Solid Mechanics 2
AE 223  Differential Equations and Balance Laws
AE 225  Environmental Building  Systems  Studio
AE 265  Structure and Properties of Materials
AE 299  Seminar
CSE 3 or TE 1 Approved  Complementary Studies Elective  or Technical Elective
WKRP 200  Work-term Report

Term 3A (Spring)

AE 279  Energy and the Environment
AE 300  Architectural Engineering Studio
AE 303  Structural Analysis
AE 353  Soil Mechanics and Foundations
AE 377  Structural Timber Design
AE 398  Seminar
1 CHANGES TO EXISTING COURSES

1.1 AMATH
   AMATH 474

1.2 PHYSICS
   PHYS 484
COURSE CHANGES  (for approval)

Applied Mathematics

Current Catalog Information
AMATH  474  (0.50)  LEC, TUT  Quantum Theory 3: Quantum Information and Foundations
Theory of correlations and entanglement; theory of quantum channels, detectors; the
measurement problem, in quantum mechanics; phase space formulation of quantum
mechanics; entanglement in infinite dimensional quantum systems; introduction to open
quantum systems; and exploration of current research directions in quantum
information. [Offered: W]
No Special Consent Required
Requisites :
Effective  01-SEP-2021
Requisite Change :
Prereq: AMATH 473/PHYS 454; Level at least 4A in Mathematics or Science
students only
New Cross Listing :
PHYS  484
Rationale :
The students in AMATH 474 come from different plans, not only Mathematical
Physics and Applied Mathematics offered through the Faculty of Mathematics,
but also several plans own by the Faculty of Science (Honours Physics,
Mathematical Physics, and Physics and Astronomy). Therefore, the Department
of Physics and Astronomy would like to cross-list PHYS 484 with AMATH 474.
Approved at Math Faculty Council on April 21 and approved by the Science
Undergraduate Studies Committee May 5.

Physics & Astronomy

Current Catalog Information  
(0.00)

Effective  01-SEP-2021
Requisite Change :
Prereq: AMATH 473/PHYS 454; Level at least 4A Mathematics or Science
students only
New Cross Listing :
AMATH  474
Rationale :
The students in AMATH 474 come from different plans, not only Mathematical
Physics and Applied Mathematics offered through the Faculty of Mathematics,
but also several plans own by the Faculty of Science (Honours Physics,
Mathematical Physics, and Physics and Astronomy). Therefore, the Department
of Physics and Astronomy would like to cross-list PHYS 484 with AMATH 474.
Approved at Math Faculty Council on April 21 and approved by the Science
Undergraduate Studies Committee May 5.

End of Report
1. NEW COURSES
   1.1. Physics

2. CHANGES TO EXISING COURSES
   2.1. Physics

3. COURSE INACTIVATION
   3.1. Physics

4. COURSE EFFECTIVE DATE CHANGE
   4.1. PHYS 365

5. ACADEMIC PLAN CHANGES (MINOR MODIFICATIONS)
   5.1. Honours Chemistry (Reg. & Co-op)
   5.2. Honours Chemistry, Biobased Specialization
   5.3. Honours Co-operative Medicinal Chemistry
   5.4. Honours Chemistry Computation Chemistry Specialization (Reg. & Co-op)
   5.5. Computational Physics Curriculum Renewal for Department of Physics and Astronomy Plans
   5.6. Physics Plan Changes Related to Computational Physics Renewal Program
      5.6.1. Honours Physics (Reg. & Co-op)
      5.6.2. Honours Physics and Astronomy (Reg. & Co-op)
      5.6.3. Honours Mathematical Physics (Reg. & Co-op)
      5.6.4. Joint Honours X with Physics
      5.6.5. Honours Life Physics, Biophysics Specialization (Reg. & Co-op)
      5.6.6. Honours Life Physics, Medical Physiology Specialization (Reg. & Co-op)
   5.7. Honours Materials and Nanosciences (Reg. & Co-op)
NEW COURSES  (for approval)

Physics & Astronomy

Effective 01-SEP-2021

PHYS 149 (0.50) LAB, LEC, TST, TUT Python Programming for Physics
Introduction to programming; basic Python usage including packages, functions, flow
control, arrays, and graphs; numerical accuracy and speed; general purpose
algorithms. Introduction to object-oriented programming concepts. [Offered: F]

Rationale: This new course introduces basic programming in Python for students in
Honours Physics, Honours Physics and Astronomy, Honours Mathematical
Physics, and Honours Materials and Nanosciences plans, as part of a
computational physics curriculum renewal plan. If the School of CS and
Faculty of Mathematics approve a revised CS 116 or create a new CS 1XX
course on Python programming, that CS course will replace PHYS 149 for
submission and approval at a fall SUC. Otherwise, PHYS 149 will be
submitted for approval and taught by the Department of Physics and
Astronomy until a CS course is approved. A CS course could possibly be
offered in winter and spring terms, but the PHYS 149 course will only be
offered in the fall term starting fall 2021.

PHYS 249 (0.50) LAB, LEC, TUT Computational Physics and Linear Algebra
Computational techniques; numerical accuracy and speed; Python libraries and
implementation; algorithms for numerical integration; matrix operations.
Computational approach to vectors in 2- and 3-space; linear equations, matrices,
determinants; eigenvalues and diagonalization. [Offered: F]

Rationale: This new course builds on computation skills learned in PHYS 149, teaching
computational physics concepts taken from PHYS 236 (which will become
inactive fall 2022) as well key linear algebra concepts formerly taught via
MATH 114, for students in Honours Physics, Honours Physics and Astronomy,
Honours Mathematical Physics, and Honours Materials and Nanosciences plans.
While some of the same concepts are taught in PHYS 249, PHYS 236 and MATH
114, there are sufficient differences that the two latter courses will not
be listed as antirequisites of PHYS 249. The course is part of a
computational physics curriculum renewal plan, and will first be offered in
fall 2022.
PHYS 349  ( 0.50 )  LAB, LEC, TUT  Advanced Computational Physics

Algorithms for solving differential equations; Monte Carlo techniques; Fourier transforms; programming and computational techniques using Python, applied to physical problems such as astrophysics, electricity and magnetism, classical and quantum mechanics; introduction to machine learning and artificial intelligence.

[Offered: W]

Requisites :
Prereq: PHYS 236 or PHYS 249; PHYS 234, PHYS 242, PHYS 263. Antireq: PHYS 239

Rationale :
This new course provides an opportunity to build on computation skills learned in PHYS 249. It replaces most of the content from PHYS 239, which will become inactive at the same time, and has a similar course description. PHYS 349 is more appropriate for third year and is one in a series of four new “X49” courses representing computational physics, and introduces concepts of Machine Learning that will be used in PHYS 449. The course explicitly requires PHYS 234, PHYS 242 and PHYS 263 as prerequisites as the course will draw on examples in electricity and magnetism, and mechanics. PHYS 236 is also listed as a prerequisite to allow students following older plans to take PHYS 349 instead of the inactivated PHYS 239 as an elective. With PHYS 236 as a prerequisite, the course can first be offered in winter 2022.

Effective 01-SEP-2021

PHYS 449  ( 0.50 )  LAB, LEC, TUT  Machine Learning in Physics

Machine learning applications in the physical sciences. [Offered: F]

Requisites :
Prereq: PHYS 236 or PHYS 349

Rationale :
This new course applies machine learning to concepts in physics and builds on computation skills learned in PHYS 249 and PHYS 349. To allow the course to be offered as early as possible, PHYS 236 is included as an optional prerequisite. The course will first be offered in fall 2021.

COURSE CHANGES  (for approval)

Current Catalog Information

PHYS 121  ( 0.50 )  LEC, TST, TUT  Mechanics

An introductory course in physics for students intending to concentrate their future studies in the physical sciences, optometry or mathematics; includes particle kinematics and dynamics, forces in nature, work and energy, conservation of energy and linear momentum, rotational kinematics and dynamics, and conservation of angular momentum. [Note: Successful completion of 4U Calculus and Vectors, 4U Advanced Functions and 4U Physics is required. Offered: F; also offered online: W]

No Special Consent Required
Requisites : Coreq: One of MATH 104, 127, 137, 147. Antireq: PHYS 111, 115, ECE 105

Effective 02-SEP-2021

Description Change: An introductory course in physics for students intending to concentrate their future studies in the physical sciences, optometry, or mathematics; includes vectors (dot and cross products), particle kinematics and dynamics, forces in nature, work and energy, conservation of energy and linear momentum, rotational kinematics and dynamics, and conservation of angular momentum. [Note: Successful completion of 4U Calculus and Vectors, 4U Advanced Functions and 4U Physics is required. Offered: F, also offered online: W]

Rationale : As part of the Department of Physics and Astronomy's computational physics renewal plan, the description for PHYS 121 is updated to include vectors (dots and cross products) as additional course content.

Current Catalog Information

PHYS 122 (0.50) LEC, TST, TUT Waves, Electricity and Magnetism
Simple harmonic motion, resonance, damped harmonic motion, wave motion and sound, electrostatic force and potential, electric current and power, capacitors, DC circuits, LRC circuits, introduction to magnetic fields Lorentz Force. [Offered: W,S; also offered online: S]
No Special Consent Required

Requisites : Prereq: PHYS 111 (minimum grade 70%) or PHYS 115 or 121 or ECE 105. Coreq: One of MATH 127, 137, 147. Antireq: PHYS 112, 125

Effective 02-SEP-2021

Description Change: Simple harmonic motion, resonance, damped harmonic motion, complex numbers, wave motion and sound, electrostatic force and potential, electric current and power, capacitors, DC circuits, LRC circuits, introduction to magnetic fields Lorentz Force. [Offered: W, S; also offered online: S]

Rationale : As part of the Department of Physics and Astronomy's computational physics renewal plan, the description for PHYS 122 is updated to include complex numbers as additional course content.

Current Catalog Information

PHYS 234 (0.50) LEC, TUT Quantum Physics 1
Background of quantum physics. Introduction to formalism of quantum physics. Introduction to operators. Quantization, waves and particles. The uncertainty principle. The Schroedinger equation for one-dimensional problems: bound states in square wells. Harmonic oscillator; transmission through barriers. [Note: PHYS 236 or knowledge of computational methods is recommended. Offered: W, S]
No Special Consent Required

Requisites : Prereq: PHYS 112 or 122; MATH 114 or 136; MATH 128 or 138 or 148. Coreq: One of MATH 228, AMATH 250, AMATH 251. Antireq: CHEM 356, NE 232, PHYS 233, ECE 405

Effective 01-SEP-2021

Description Change: Background of quantum physics. Introduction to formalism of quantum
physics. Introduction to operators. Quantization, waves, and particles. The uncertainty principle. The Schrödinger equation for one-dimensional problems: bound states in square wells, harmonic oscillator, transmission through barriers. [Note: PHYS 149, PHYS 236, or knowledge of computational methods is recommended. Offered: W, S]

Requisite Change:
Prereq: PHYS 112 or 122; One of PHYS 249, MATH 114, 136; One of MATH 128, 138, 148. Coreq: One of MATH 228, AMATH 250, AMATH 251. Antireq: CHEM 356, NE 232, PHYS 233, ECE 405

Rationale:
As part of the computational physics renewal plan within the Department of Physics and Astronomy, content from MATH 114 is being moved into PHYS 249, therefore, it is added as an optional prerequisite. As part of the same plan, PHYS 149 will be introduced as a new programming course, therefore the description note is updated to recommend taking PHYS 149 before PHYS 234.

Current Catalog Information
PHYS 267 (0.50) LEC, TUT Probability, Statistics, and Data Analysis for Physics and Astronomy
Probability, probability distributions, errors, descriptive statistics, statistical inference (hypothesis testing, fitting, confidence intervals), computational methods (e.g., Monte Carlo), examples from physics and astronomy. [Offered: W, S]
No Special Consent Required
Requisites:
Prereq: PHYS 122, MATH 227; PHYS 236 or CS 116. Antireq: STAT 230, 231

Effective 01-SEP-2021
Description Change:
Probability, probability distributions, errors, descriptive statistics, statistical inference (hypothesis testing, fitting, confidence intervals), computational methods (e.g., Monte Carlo) in Python, examples from physics and astronomy. [Offered: W, S]

Requisite Change:
Prereq: PHYS 122, MATH 227; One of PHYS 149, 236 or CS 116. Antireq: STAT 230, 231

Rationale:
As part of the computational physics renewal plan by the Department of Physics and Astronomy, Python is the choosen programming language for new computational courses, building off of PHYS 149, a new program requirement in physics department plans. As such, Python is explicitly added to the description for PHYS 267 and PHYS 149 is added as an option to the list of required prerequisites.

Current Catalog Information
PHYS 359 (0.50) LEC, TUT Statistical Mechanics
No Special Consent Required
Requisites:
Prereq: (PHYS 358 or ECE 403 or CHEM 254 or ME 250); (PHYS 233 or 234 or CHEM 356 or co-requisite: AMATH 373).
Effective 01-SEP-2024

Requisite Change:
Prereq: One of PHYS 149, 236, CS 116, 136; (PHYS 358 or ECE 403 or CHEM 254 or ME 250); (One of PHYS 233, 234, CHEM 356 or Coreq: AMATH 373)

Rationale:
A programming course requisite is added to PHYS 359 to allow the use of computational problems in the course. An effective date of Sept. 1, 2024 is needed to accommodate MNS plans having appropriate prerequisites.

Current Catalog Information
PHYS 363  (0.50)  LEC, TUT
Intermediate Classical Mechanics
No Special Consent Required
Requisites:
Prereq: One of PHYS 263, AMATH 261, 271; One of MATH 227, 228, 247; One of MATH 250, AMATH 250, AMATH 251

Effective 01-SEP-2021

Description Change:

Requisite Change:
Prereq: One of PHYS 149, 236, CS 116, 136; One of PHYS 263, AMATH 261, 271; One of MATH 227, 228, 247; One of MATH 228, AMATH 250, AMATH 251

Rationale:
A programming course requisite is added to PHYS 363 to allow the use of computational problems in the course. As such, the description note recommending PHYS 236 is removed because it is no longer required.

Current Catalog Information
PHYS 364  (0.50)  LEC, TUT
Mathematical Physics 1
No Special Consent Required
Requisites:
Prereq: MATH 227, MATH 228 or AMATH 250 or 251; Honours Physics, Chemical Physics, Physics and Astronomy, Life Physics and Materials and Nanosciences students only. Antireq: AMATH 353

Effective 01-SEP-2021

Requisite Change:
Prereq: One of PHYS 149, 236, CS 116, 136; One of MATH 227, 228, AMATH 250, 251; Honours Physics, Chemical Physics, Physics and Astronomy, Life Physics and Materials and Nanosciences students only. Antireq: AMATH 353

Rationale:
A programming course requisite is added to PHYS 364 to allow the use of computational problems in the course.

Current Catalog Information
PHYS 375  (0.50)  LEC, TUT
Stars
Stellar distances, masses, ages. Stellar interiors and atmospheres, star formation and evolution. Supernovae, white dwarfs, neutron stars, black holes. [Offered: W]
No Special Consent Required

Requisites:

Effective 01-SEP-2021

Prereq: PHYS 112 or 122 and two of PHYS 234, 242, 256, 275, 358, AMATH 271

Requisite Change:

Prereq: PHYS 112 or 122; One of PHYS 149, 236, CS 116, 136; Two of PHYS 234, 242, 256, 275, 358, AMATH 271

Rationale:

A choice of one of four programming courses is added to the prerequisite requirement for PHYS 375. Explicitly requiring a programming course will allow the use of computational problems in the course.

COURSE INACTIVATIONS (for approval)

Effective 01-SEP-2022

PHYS 236 (0.50) Computational Physics 1

Rationale:

The computational content of this course is being merged with linear algebra content from MATH 114, into a new course, PHYS 249, which will be one of four new computational physics courses being introduced into physics plans as part of a computational physics renewal plan by the Department of Physics and Astronomy. Of the four new courses, PHYS 149 and PHYS 249 will be required, while PHYS 349 and PHYS 449 will be optional PHYS elective courses. PHYS 236 will last be offered fall 2021.

Effective 01-SEP-2021

PHYS 239 (0.50) Computational Physics 2

Rationale:

Content of this PHYS elective course is being placed in a new course, PHYS 349, which will be one of four new computational physics courses being introduced into physics plans as part of a computational physics renewal plan by the Department of Physics and Astronomy. Of the four new courses, PHYS 149 and PHYS 249 will be required, while PHYS 349 and PHYS 449 will be optional PHYS elective courses. The description of PHYS 349 reads similar to PHYS 239, but the course has been reworked into a third year course in the new "X49" number series to represent the computational physics content, therefore, requiring inactivation of PHYS 239, which will last be offered spring 2021.

End of Report
4 COURSE EFFECTIVE DATE CHANGE

4.1 PHYS 365

Effective Date: September 1, 2023

Background and Rationale:
The description change to remove “introductory probability and statistics” and to add “Green's functions, approved at the September 2019 SUC, for a September 1, 2022 effective date, needs to be effective one year later, to ensure students will have the statistics background via PHYS 267. Co-op students who started in 2019 will not have access to PHYS 267 and are scheduled to take PHYS 365 winter 2023, therefore, the changes can only take effect Sept. 1, 2023 at earliest.
5 ACADEMIC PLANS (MINOR MODIFICATIONS)

5.1 Honours Chemistry (Reg. & Co-op)

Effective Date: September 1, 2021.

Background and Rationale:
The list of appropriate program electives for these plans has always existed on the Chemistry website. The Calendar listed the program requirements to include the program electives, which were linked back to the webpage. To explicitly list all the program requirements within the Calendar, the list of program electives will be added directly to the Calendar and the link to the web page will be removed.

The following list of program electives will be added to the Honours Chemistry (Reg. & Co-op) program pages:

List of Program Electives
CHEM 209 Introductory Spectroscopy and Structure
CHEM 224L Analytical Instrumentation Laboratory
CHEM 310 Transition Element Compounds and Inorganic Materials
CHEM 310L Inorganic Chemistry Laboratory 2
CHEM 313 Main Group and Solid State Chemistry
CHEM 323 Analytical Instrumentation
CHEM 331 Fundamentals of Metabolism 1
CHEM 333 Metabolism 1
CHEM 340 Introductory Computational Chemistry
CHEM 350 Chemical Kinetics
CHEM 350L Physical Chemistry Laboratory 2
CHEM 357 Physical Biochemistry
CHEM 360 Organic Chemistry 3
CHEM 360L Senior Organic Chemistry Laboratory
CHEM 363 Organic Process Chemistry
CHEM 370 Introduction to Polymer Science
CHEM 381 Bioorganic Chemistry
CHEM 382L Advanced Organic Synthesis Laboratory
CHEM 383 Medicinal Chemistry
CHEM 400 Special Topics in Chemistry
CHEM 404 Physicochemical Aspects of Natural Waters
CHEM 430 Special Topics in Biochemistry
CHEM 432 Metabolism 2
CHEM 433 Advanced Biochemistry
CHEM 464 Spectroscopy in Organic Chemistry
CHEM 481 Rational Design of Potential Drug Candidates
CHEM 494A Research Project
CHEM 494B Research Project
5.2 Honours Chemistry, Biobased Specialization

Effective Date: September 1, 2021

Background and Rationale:
The list of appropriate program electives for this plan has always existed on the Chemistry website. The Calendar listed the program requirements to include the program electives, which were linked back to the web page. To explicitly list all program requirements within the Calendar, the list of program electives will be added directly to the Calendar and the link to the web page will be removed.

The following list of program electives will be added to the Honours Chemistry, Biobased Specialization program page:

List of Program Electives
CHEM 209 Introductory Spectroscopy and Structure
CHEM 224L Analytical Instrumentation Laboratory
CHEM 250L Physical Chemistry Laboratory 1
CHEM 310 Transition Element Compounds and Inorganic Materials
CHEM 310L Inorganic Chemistry Laboratory 2
CHEM 313L Inorganic Chemistry Laboratory 1
CHEM 323 Analytical Instrumentation
CHEM 335L Advanced Biochemistry Laboratory
CHEM 340 Introductory Computational Chemistry
CHEM 350 Chemical Kinetics
CHEM 350L Physical Chemistry Laboratory 2
CHEM 357 Physical Biochemistry
CHEM 360 Organic Chemistry 3
CHEM 360L Senior Organic Chemistry Laboratory
CHEM 363 Organic Process Chemistry
CHEM 370 Introduction to Polymer Science
CHEM 381 Bioorganic Chemistry
CHEM 382L Advanced Organic Synthesis Laboratory
CHEM 383 Medicinal Chemistry
CHEM 400 Special Topics in Chemistry
CHEM 404 Physicochemical Aspects of Natural Waters
CHEM 430 Special Topics in Biochemistry
CHEM 432 Metabolism 2
CHEM 433 Advanced Biochemistry
CHEM 464 Spectroscopy in Organic Chemistry
CHEM 481 Rational Design of Potential Drug Candidates
5.3 Honours Co-operative Medicinal Chemistry

**Effective Date:** September 1, 2021

**Background and Rationale:**
The list of appropriate program electives for this plan has always existed on the Chemistry website. The Calendar listed the program requirements to include the program electives, which were linked back to the web page. To explicitly list all program requirements within the Calendar, the list of program electives will be added directly to the Calendar and the link to the web page will be removed.

The following list of program electives will be added to the Honours Co-operative Medicinal Chemistry program page:

**List of Program Electives**
- CHEM 209 Introductory Spectroscopy and Structure
- CHEM 310L Inorganic Chemistry Laboratory 2
- CHEM 313 Main Group and Solid State Chemistry
- CHEM 323 Analytical Instrumentation
- CHEM 350L Physical Chemistry Laboratory 2
- CHEM 356 Introductory Quantum Mechanics
- CHEM 357 Physical Biochemistry
- CHEM 363 Organic Process Chemistry
- CHEM 370 Introduction to Polymer Science
- CHEM 400 Special Topics in Chemistry
- CHEM 404 Physicochemical Aspects of Natural Waters
- CHEM 430 Special Topics in Biochemistry
- CHEM 432 Metabolism 2
- CHEM 433 Advanced Biochemistry
- CHEM 481 Rational Design of Potential Drug Candidates

5.4 Honours Chemistry, Computational Chemistry Specialization (Reg. & Co-op)

**Effective date:** September 1, 2021

**Background and Rationale:**
The maximum number of SCI units that can be used toward these plans is reduced from 3.0 to 2.5, as there are only 2.5 units of “free” electives available.
Additional Program Conditions:

1. Alternative electives may be substituted with prior approval of the academic advisor.
2. A maximum of 2.5 SCI units can be used towards this degree.
3. A maximum of two failed CHEM courses is allowed. Failure in more than two CHEM courses will result in the requirement to withdraw from the academic plan.

5.5 Computational Physics Curriculum Renewal for Department of Physics and Astronomy Plans

Effective date: September 1, 2021

Background and Rationale:
Students in Physics programs are currently underserved in computational physics training. Computational physics training is currently offered in PHYS 236 and PHYS 239, the former with a broad population of students, including almost 50% with no programming experience. PHYS 236 is required only for PHYS 239, and PHYS 239 is not required for any course that follows, allowing no opportunity to build on the limited computational skills that have been introduced.

A recently introduced data analysis/statistics course, PHYS 267, has a significant computational component and requires PHYS 236. These two courses have the potential to serve as a strong foundation for upper year courses that use or build on computational physics. However, the need to teach basic programming in PHYS 236 would be better served content in a first-year course. Meanwhile MATH 114 (Linear Algebra) which contains important training on matrices, eigenvalues, eigenvectors etc., is sequenced in 1A for Physics programs, which is too distant from when it is used in 2B, and in practice this material is being retaught in a two to three-week period in PHYS 234. Thus, an opportunity to teach linear algebra in a computational context, by merging it with the content currently taught in PHYS 236, was identified, resulting in a Physics curriculum revision, summarized as follows, that provides one computational course per year:

- A new first year course, PHYS 149*, is introduced in 1A to teach basic Python programming (Given the widespread usage of Python, particularly for machine learning applications in physics and astronomy, this is the language of choice to use in courses within Physics programs)
- PHYS 236 is inactivated to be replaced by PHYS 249
- A new second year course, PHYS 249, is introduced to teach computational physics and linear algebra
- PHYS 239 is inactivated to be replaced by PHYS 349
- A new third year course, PHYS 349, is introduced to build on computational skills learned in PHYS 249; it will serve as a PHYS elective for interested students
• A new fourth year course, PHYS 449, is introduced to teach machine learning applications in physics; it will serve as a PHYS elective for interested students
• The MATH 114 requirement is removed from Honours Physics and Honours Physics and Astronomy plans, as the needed material is covered in other courses, primarily PHYS 249
• An elective is removed from Honours Mathematical Physics plans to accommodate the addition of PHYS 149* and the advance Linear Algebra course, MATH 136 is sequenced after PHYS 249
• PHYS 149* (or equivalent) is added as a prerequisite for PHYS 359, PHYS 363, PHYS 364, PHYS 365, and PHYS 375 to make use of the computational training
• PHYS 249 (or equivalent) is added as an alternative prerequisite for PHYS 467, which is held with CO 481 and CS 467

* If the CS Department and Faculty of Mathematics approve a revised CS 116 or create a new CS 1XX course on Python programming, that CS course will replace PHYS 149 for submission and approval at a fall SUC. Otherwise, PHYS 149 will be submitted, and taught by the department of Physics and Astronomy until a CS course is approved.

There is support from the Faculty of Mathematics for the plan, even though MATH 114 will loose significant enrolment from Physics students.

5.6 Physics Plan Changes Related to Computation Physics Curriculum Renewal

5.6.1 Honours Physics (Reg. & Co-op)

1. 22.0 units that include:
   o 10.0 10.5 PHYS units: PHYS 121, PHYS 122, PHYS 124, PHYS 131L, PHYS 132L, PHYS 149, PHYS 232L, PHYS 234, PHYS 236, PHYS 242, PHYS 242L, PHYS 249, PHYS 256, PHYS 256L, PHYS 260L, PHYS 263, PHYS 267, PHYS 334, PHYS 342, PHYS 358, PHYS 359, PHYS 360A, PHYS 363, PHYS 364, and PHYS 365
   o 2.5 2.0 MATH units: MATH 114, MATH 127, MATH 128, MATH 227, and MATH 228
   o 1.25 CHEM units: CHEM 120, CHEM 120L, and CHEM 123
   o 0.5 ENGL unit: ENGL 193/SPCOM 193
   o 7.75 elective units distributed as follows:
     ▪ 2.0 PHYS lecture units that must include at least 1.5 units at the 400-level
     ▪ 0.25 PHYS lab unit at the 300- or 400-level
   o 5.5 units chosen from any subject, with a maximum of 1.5 lab units
5.6.2 Honours Physics and Astronomy (Reg. & Co-op)

22.0 units that include:

- **11.25** - **11.75** PHYS units: PHYS 121, PHYS 122, PHYS 124, PHYS 131L, PHYS 149, PHYS 175, PHYS 175L, PHYS 234, PHYS 236, PHYS 242, PHYS 242L, PHYS 249, PHYS 256, PHYS 256L, PHYS 263, PHYS 267, PHYS 270L, PHYS 334, PHYS 342, PHYS 358, PHYS 359, PHYS 363, PHYS 364, PHYS 370L, PHYS 375, PHYS 474, and PHYS 475
- **1.0** PHYS elective unit selected from: PHYS 249, PHYS 275, or PHYS 476
- **2.5** - **2.0** MATH units: MATH 114, MATH 127, MATH 128, MATH 227, and MATH 228
- **1.25** CHEM units: CHEM 120, CHEM 120L, and CHEM 123
- **0.5** ENGL unit: ENGL 193/SPCOM 193
- **5.5** elective units distributed as follows:
  - 1.5 PHYS lecture units that include at least a 0.5 unit at the 400-level
  - 0.5 PHYS lab unit 300-level or higher
  - 3.5 units chosen from any subject, with a maximum of 1.5 lab units

5.6.3 Honours Mathematical Physics (Reg. & Co-op)

21.0 units that include:

- **7.25** - **7.75** PHYS units: PHYS 121, PHYS 122, PHYS 124, PHYS 131L, PHYS 132L, PHYS 149, PHYS 234, PHYS 236, PHYS 242, PHYS 249, PHYS 263, PHYS 342, PHYS 358, PHYS 359, PHYS 363, PHYS 434, and PHYS 442
- **2.5** MATH units: MATH 136, MATH 137, MATH 138, MATH 235, and MATH 237
- **3.0** AMATH units: AMATH 231, AMATH 250, AMATH 332, AMATH 351, AMATH 353, and AMATH 373
- **1.0** STAT unit: STAT 230 and STAT 231
- **1.25** CHEM units: CHEM 120, CHEM 120L, and CHEM 123
- **0.5** ENGL unit: ENGL 193/SPCOM 193
- **5.5** - **5.0** elective units distributed as follows:
  - 1.5 PHYS or AMATH lecture units at the 300-level or higher
  - 1.5 program elective units chosen from: PHYS 444, PHYS 454, PHYS 476, AMATH 361, AMATH 456, or AMATH 463
  - **2.5** - **2.0** units chosen from any subject, with a maximum of 1.5 lab units
5.6.4 Joint Honours X with Physics

The successful completion of the Joint Honours X with Physics plan requires the following:

13.75 units distributed as follows:

- **2.5** MATH units: MATH 114, MATH 127, MATH 128, MATH 227, and MATH 228 (or equivalents)
- **10.0** PHYS units: PHYS 121, PHYS 131L, PHYS 122, PHYS 124, PHYS 132L, PHYS 149, PHYS 232L, PHYS 234, PHYS 236, PHYS 242, PHYS 242L, PHYS 249, PHYS 256, PHYS 256L, PHYS 260L, PHYS 263, PHYS 334, PHYS 342, PHYS 358, PHYS 359, PHYS 360A, PHYS 363, PHYS 364, and PHYS 365
- **1.5** PHYS lecture units, 400-level
- **0.25** PHYS lab unit, 300-level or higher

5.6.5 Honours Life Physics, Biophysics Specialization (Reg. & Co-op)

Suggested Electives...

**Interested in Experimental Methods**
2.0 units from the following: BIOL 335L, BIOL 361, PHYS 131L (in place of PHYS 111L), PHYS 132L (in place of PHYS 122L), PHYS 236, PHYS 249, PHYS 260L, or PHYS 391/PHYS 391L

**Interest in Theoretical Methods**
2.0 units from the following: BIOL 364, BIOL 382/AMATH 382, PHYS 236, PHYS 249, PHYS 334, PHYS 364, PHYS 365, PSYCH 420, SYDE 544, or SYDE 584 (if BIOL 273 not yet completed)

5.6.6 Honours Life Physics, Medical Physiology Specialization (Reg. & Co-op)

Suggested Electives for the Medical Physics Specialization

BIOL 201 Human Anatomy
CHEM 333 Metabolism 1
PHYS 249 Computational Physics and Linear Algebra
PHYS 349 Advanced Computational Physics
PHYS 236 Computational Physics 1
PHYS 239 Computational Physics 2
PHYS 391/PHYS 391L Electronics/Electronics Laboratory
PHYS 437A Research Project
PHYS 437B Research Project (continued)
STAT 202 Introductory Statistics for Scientists
5.7 Honours Materials and Nanosciences (Reg. & Co-op)

Effective Date: September 1, 2021

Background and Rationale:

There are several changes proposed for Material and Nanosciences plans (MNS) that have been approved by both the Departments of Physics and Astronomy and Chemistry. They primarily include the introduction of two new course requirements (PHYS 149 and PHYS 249), and the removal of three course requirements (MATH 114, CHEM 237, and one elective), resulting in a total overall unit reduction by 0.5 unit. More courses are added to the list of program electives and the CHEM 264 or CHEM 266 requirement is no longer listed under total electives, but rather as a CHEM requirement necessary as a corequisite for the CHEM 266L requirement.

In line with the Computational Physics curriculum renewal, the MNS plans will also remove the MATH 114 requirement in first year, to incorporate a new Python programming course, PHYS 149, as well as a new computational and linear algebra course, PHYS 249, as requirements. Important training from MATH 114 will be incorporated into PHYS 249, which will be sequenced into second year where it will be closer to subsequent courses requiring knowledge of the material. PHYS 249 requires PHYS 149 as a prerequisite. PHYS 236 is removed from the recommended elective list because it will be inactivated and there is content overlap with PHYS 249.

To accommodate the addition of PHYS 249 in Year two fall, CHEM 209 is being sequenced to Year four fall, as this important course is not required as a prerequisite for other program requirements. Similarly, PHYS 334 is being sequenced in Year three winter versus Year four winter, to place it closer to its prerequisite, PHYS 234, and to provide fourth year students, enrolled in research projects, more time for research.

The introductory biochemistry course, CHEM 237, will be removed as a requirement for the MNS plans as it is not required as a prerequisite for any later required courses. Instead, students will be required to select a CHEM program elective of choice as one of their electives, to keep a balance between CHEM and PHYS courses, and to provide greater flexibility to take some recently added 200-level CHEM program electives, which will include CHEM 237.

A recently introduced data analysis/statistics course, PHYS 267, has a significant computational component and would be a beneficial course for MNS students. Therefore, PHYS 267 will be added to the list of program electives.

The 0.5-unit requirement of either CHEM 264 or CHEM 266 is being removed from the list of required electives. CHEM 266L is a required course, with a corequisite of an organic chemistry lecture, thus CHEM 264 or CHEM 266 are CHEM requirements rather than electives.

Finally, total program units will be reduced from 21.75 to 21.25. To provide some relief from the demanding MNS plans, the total number of program electives, at any level, are reduced from 1.5 to 1.0 unit, resulting in a reduction of total elective units from 5.0 to 4.5. These electives will be redistributed throughout the plans to provide better balance in course load across the terms. For the regular plan only, CHEM 266/266L will be sequenced into third year versus second year to provide an elective in second year.
Successful completion of this program requires:

1. **21.25** units that include:
   - 5.0 MNS units: MNS 101, MNS 102, MNS 201L, MNS 211, MNS 221, MNS 321, MNS 322, MNS 331, MNS 410, and MNS 431
   - 3.5 CHEM units: CHEM 121, CHEM 121L, CHEM 125, CHEM 125L, CHEM 140, CHEM 209, CHEM 250L, CHEM 254, and CHEM 266L
   - 0.5 CHEM unit from CHEM 264 or CHEM 266 (Refer to Note)
   - 4.25 PHYS units: PHYS 121, PHYS 121L, PHYS 122, PHYS 122L, PHYS 149, PHYS 232L, PHYS 234, PHYS 249, PHYS 242, PHYS 334, PHYS 342, and PHYS 359
   - 2.5 MATH units: MATH 114, MATH 127, MATH 128, MATH 227, and MATH 228
   - 6.0 elective units, distributed as follows:
     - 0.5 unit from CHEM 233 or CHEM 237 (Refer to Note 1)
     - 0.5 unit from CHEM 264 or CHEM 266 (Refer to Note 2)
     - 1.0 program unit, 300-level or higher
     - 1.0 program unit, 400-level
     - 1.5 program units 1.0 program unit, any level, at least 0.5 unit from Chemistry
     - 1.5 units of any 0.25 or 0.5 unit courses
   - 0.5 ENGL unit: ENGL 193/SPCOM 193

**Notes**

1. Students wishing to take CHEM 233 and CHEM 237L must obtain permission from the instructor of CHEM 237L to override the prerequisite of CHEM 237.
2. Students wishing to take CHEM 264 instead of CHEM 266 must obtain permission from the instructor of CHEM 266L to override the prerequisite of CHEM 266.
CONTENT

1. NEW PLAN (MAJOR MODIFICATION)
   1.1. Diploma in English for Multilingual Speakers ................................................................. 2

2. PLAN INACTIVATION
   2.1. Certificate in English for Multilingual Speakers ................................................................. 2
1. NEW PLAN (MAJOR MODIFICATION)

1.1 Diploma in English for Multilingual Speakers

Effective date: September 1, 2021

Rationale: Due to changes in the definition of Certificates and Diplomas established by the Common Language Working Group, the Certificate in English for Multilingual Students has been deactivated. This means the undergraduate EMLS Certificate will no longer be recorded on students’ official transcripts. In order to maintain a pathway for students who still wish to have an EMLS credential on their official transcripts, we are proposing a Diploma in English for Multilingual Speakers. Students who demonstrate their commitment to continuous improvement in their English language skills throughout their programs should have their efforts recognized and reflected on their official transcripts.

Proposed calendar text:

Students for whom English is an additional language, and who are registered in degree programs or any non- or post-degree academic plan at the University of Waterloo, are eligible to take a diploma in English for Multilingual Speakers (EMLS). The Diploma in EMLS requires successful completion of a minimum of two (2.0) academic course units (four courses) in EMLS with a minimum cumulative average of 65%.

2. PLAN INACTIVATION

2.1 Certificate in English for Multilingual Speakers

Calendar path: Certificate in English for Multilingual Speakers

Effective date: September 2021

Rationale: The Certificate in English for Multilingual Speakers (EMLS) at the undergraduate level was implemented under the previous definition of Certificates, which allowed students to earn a Certificate through the completion of three courses. This no longer fits the new definition of Certificates established by the Common Language Working Group. Therefore, this Certificate is being inactivated.
Handling of Final Assessment Reports & Two-Year Progress Reports related to academic program reviews

Introduction
Waterloo’s Senate Undergraduate Council (SUC) and Senate Graduate and Research Council (SGRC) have a duty to consider all aspects relating to the academic quality of undergraduate studies and graduate studies within the University. As described in Waterloo’s Institutional Quality Assurance Process (IQAP), documentation emerging from the cyclical program review process includes:

- **Final Assessment Report**, which summarizes the self-study, external reviewers’ report, program response, and implementation plan, and
- **Two-Year Progress Report**, which reports on progress related to the implementation plan.

Final Assessment Reports (FARs), require two SUC or SGRC members to review the report, whereas, Two-Year Progress Reports only require one SUC or SGRC member, although at the SUC/SGRC Chair’s discretion, a second reviewer may be sought. In order to ensure that student representatives have the opportunity to review each report, the WUSA VP, Education and GSA President receive these documents in advance for information. Any questions or concerns they might have can be raised and addressed, if needed, prior to the report being approved at SUC/SGRC. This review process is coordinated by the Quality Assurance (QA) Office.

To promote transparency and foster integrity in the review process, reviewers should not be members of the Faculty or Affiliated and Federated Institutions of Waterloo (AFIW) from which the report originates.

Assessment
Reviewers will consider a series of guiding questions (see below) in arriving at their recommendation for revision or approval to SUC or SGRC. Before reporting to SUC or SGRC, reviewers will ask questions and share their observations, as well as any concerns they have identified with the report, to the Quality Assurance Office, who will then connect with the Chair or Director of the program. The FEDS and GSA representative will also receive these reports for information prior to submission to SUC/SGRC.

The Quality Assurance Office will ensure that any revisions to the reports are completed by the Chair or Director of the program, prior to the QA Office submitting the report for approval at a SUC or SGRC.

**Does the Final Assessment Report:**

1) Include a credible implementation plan that not only addresses the substantive issues identified from the program review process but also identifies clearly:

- What actions will follow from specific recommendations?
- Who will be responsible for acting on those recommendations?
- Who will be responsible for providing resources?
- Priorities for implementation and realistic timelines for initiating and monitoring actions?

2) Provide a rationale as to why a recommendation(s) will not be pursued?
**Does the Two-Year Progress Report:**

1) Clearly describe progress achieved on the various action items in the implementation plan?

2) Explain convincingly any circumstances that would have altered the original implementation plan?

3) For items that are behind schedule, propose an amended implementation schedule that is reasonable and credible?

4) Address significant developments or initiatives that have arisen since the program review process, or that were not contemplated by the program review process?

The program Chair or Director (or their chosen delegate) will attend the SUC or SGRC meeting to address any questions or concerns that might arise during SUC/SGRC.

SUC’s and SGRC’s responsibility will be to focus on the overall credibility and feasibility of the report and the proposed plan of action – seeking to uncover, for example, unexplained disjunctions between the reviewers’ recommendations and the program’s response – as opposed to the minutiae of course content and curriculum structure.

A Final Assessment Report or Two-Year Progress Report that is approved by a majority vote of SUC/SGRC will be submitted to Senate for information. Should the discussion at SUC or SGRC reveal issues of concern that require revision, the Quality Assurance Office will work with the program Chair or Director to address the concern(s). If minor revisions are needed, the report will be edited and then it will proceed to Senate for information without re-approval from SUC/SGRC; however, any major revisions will require SUC/SGRC review and approval.

**Status of Reports under Review**
A summary of the status of all reports under review, including reports for which the QA Office is seeking reviewers, can be found at the following link: [https://uwaterloo.ca/academic-program-reviews/status-reports-under-review](https://uwaterloo.ca/academic-program-reviews/status-reports-under-review)
Final Assessment Report
Religious Studies (BA, Minor, PhD), Jewish Studies (Minor)
January 2020

Executive Summary
External reviewers found that the Religious Studies (RS) programs (BA, Minor) and Jewish Studies Minor delivered by the Department of Religious Studies1 were in good standing. The reviewers also agreed that the PhD in Religious Studies, jointly offered with Department of Culture and Religion at Wilfrid Laurier University, was in good standing.

“Both programs are in overall good standing and have excellent faculty.”

A total of 6 recommendations were provided by the reviewers, regarding administrative matters, curricular matters, addressing the decrease in majors and course enrolments, and renewing the doctoral program. In response, the program created a plan outlining the specific actions proposed to address each recommendation as well as a timeline for implementation. The next cyclical review for this program is scheduled for 2024-2025.

Student Complement (All Years)*

<table>
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<tr>
<th></th>
<th>BA General</th>
<th>BA Honours Regular</th>
<th>BA Honours Co-op</th>
<th>Religious Studies Minor</th>
<th>Jewish Studies Minor</th>
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*Active Students Extract pulled from Quest December 2, 2019

Background
In accordance with the University of Waterloo’s Institutional Quality Assurance Process (IQAP), this final assessment report provides a synthesis of the external evaluation and the internal response of the programs (BA, Minors, PhD) delivered by the Department of Religious Studies. A self-study (Volume I, II, III) was submitted to the Associate Vice-President, Academic and

1 The Department of Religious Studies is a joint venture between five agencies of the University of Waterloo: the Faculty of Arts, Conrad Grebel University College, St. Paul’s University College, St. Jerome’s University, and Renison University College [hereafter: the five agencies]. This arrangement is unique within the University in that it is not simply a shared discipline across the various institutions but a shared Department.
Associate Vice-President, Graduate Studies and Postdoctoral Affairs on October 25, 2018. The self-study (Volume I) presented the program descriptions and learning outcomes, an analytical assessment of the programs, including the data collected from a student survey, along with the standard data package prepared by the Office of Institutional Analysis & Planning (IAP). The CVs for each faculty member with a key role in the delivery of the program(s) were included in Volume II of the self-study.

From Volume III, two arm’s-length external reviewers were selected by the Associate Vice-President, Academic and Associate Vice-President, Graduate Studies and Postdoctoral Affairs: Dr. Alison Marshall, Professor of Religion, Brandon University, and Dr. Noel Salmond, Professor of Religion, Carleton University.

Reviewers appraised the self-study documentation and conducted a site visit to the University of Waterloo (UW) and Wilfrid Laurier University (WLU) on December 10-11, 2018. An internal reviewer from the University of Waterloo, Dr. Marc Aucoin, Professor of Chemical Engineering, was selected to accompany the external reviewers. The visit included interviews with the Vice-President, Academic & Provost (UW); Associate Vice-President, Academic (UW); Dean of Arts (UW); Dean of Graduate and Postdoctoral Studies (WLU); Chair of Religious Studies (UW), Chair of Religion and Culture (WLU), and UW and WLU Faculty members and staff. The Review Team also had the opportunity to meet with current UW undergraduate and graduate students, WLU PhD students and representatives from the library.

This final assessment report is based on information extracted, in many cases verbatim, from the self-study, the external reviewers’ report and the program response.

Program characteristics

**Religious Studies (BA):** The Religious Studies program allows students to take courses in the areas of World Religions, Christian Traditions, and Religion, Culture and Society. Through their training in method and theory and development of analytical skills, Religious Studies graduates are able to contribute meaningfully to their local communities, Canada, and global society, discussions on contemporary issues regarding religion and public policy, and the broader “issues of the day.”

**Religious Studies (Minor):** The Religious Studies Minor is often added to complement a non-Religious Studies major. Students frequently comment that since Canada is multicultural, it is good to know about people from a variety of cultural/religious contexts.

**Jewish Studies (Minor):** The Jewish Studies Minor is a program centred on Jewish philosophy, belief, and social history as well as the Bible. It exposes both Jewish and non-Jewish students to Jewish thought, and the interaction and influence of Jewish thought on the development of Christianity and Islam, and offers courses that expose students to the richness of Jewish thought and culture while developing their oral and written competence, and analytic abilities.
Religious Studies (PhD) – joint with Wilfrid Laurier University: The Joint Laurier-Waterloo PhD Program in Religious Studies leads to the Doctor of Philosophy degree, with a research specialization in Religious Diversity in North America. Strongly interdisciplinary, this joint program draws on the combined resources of the Department of Religion and Culture at Wilfrid Laurier University and the Department of Religious Studies at the University of Waterloo, as well as numerous adjunct and associated faculty in different departments at both institutions, including Anthropology, History, Philosophy, Psychology, and Sociology.

Summary of strengths, challenges and weaknesses based on self-study

**Strengths:** The greatest strength of the program is the quality of the faculty and staff. Professors are dedicated to the intellectual development of their students and sound pedagogical means by which they can accomplish this goal. They understand the value of research as both part of their own career development and as a means of enhancing their teaching. The Administrative Assistant is not only knowledgeable and professional, but also dedicated to the programs and ways to improve them. There are no other staff members in the department.

**Challenges:** First, RS overall undergraduate enrolment is down about 40% since the 2011 review. Several reasons for this were suggested, including: the complexity of the program; the difficulty in scheduling required courses (e.g., RS 260); the ongoing secularization of Canadian society (which means younger cohorts have little exposure to religion), and the turn to STEM disciplines across Canada and the United States after the 2008 global financial crisis (not many parents see a connection between religious studies and the job market). The programs must increase their visibility on campus and educate students on the importance and value of having a solid grasp of religion in Canada and the world.

Time for online course development is also a major challenge. The Department has decided to put RS260 (How to Study Religion) online in order to mitigate the problem of students dropping the major(s). This will make the course far more accessible, but unfortunately developing online courses takes time and money.

Several retirements have not been replaced and several faculty are currently working on reduced loads, and thus the Department cannot mount the number or variety of courses as desired (particularly 300-level courses).

Finally, the administrative load of the Chair continues to increase, as faculty have less time to devote to department planning and activities. There is also concern around the impending retirement of one or more colleagues.
**Weaknesses:** In short, the weakness of the programs is that they are lacking in sufficient human resources. Overburdened faculty cannot offer as many courses and cannot attend Department and student events with any regularity; and they publish and attend professional conferences less regularly. Program and curricular changes take longer to develop and implement, which has hampered the program’s ability to introduce courses that would appeal to a new cohort of students whom, studies have shown, to have had increasingly less direct experience of religion. A further weakness is the lack of an FTE in Islam, an omission that gets more critical as the years pass.

**Summary of key findings from the external reviewers**

The reviewers found that both the undergraduate and graduate programs were in good standing. The undergraduate program was commended for its faculty’s ability to collaborate together “…at an arm’s-length to deliver an impressively broad range of courses”. In addition, the doctoral program was recognized as unique within Canada and as having a reputation for producing high-quality students.

**Program Response to External Reviewers’ Recommendations**

1. Empower the [Chair of the Department] with more oversight/authority to undertake a review of all UW RS undergraduate and PhD joint program faculty and conduct a department retreat in order to reduce the duplication of course offerings, to boost the flow of enrolment in upper level courses, increase collaborations between the universities, and explore potential collaborations with other units (e.g., Peace and Conflict Studies).

**Response**

As indicated in the self-study report, while the Department operates as much as possible like any other department in Arts, in fact it is structured more as a Centre. With the exception of two Waterloo professors (Diamond and Jakobsh), the Department does not hire or evaluate its faculty nor does it assign or schedule courses. Rather, it takes advantage of a variety of resources that it does not control directly. In effect, the Chair operates as a coordinator, who leads the five agencies in a collaborative effort. While inelegant in theory, according to the assessors this model works well in practice, because of the collegial environment of the department and the good will of all five agencies.

However, this highly decentralized structure does present the Department with a number of challenges:

- Lack of communication about sabbaticals, retirements, secondments, teaching releases, etc.
• Lack of control over course scheduling
• Absence of evaluation by the Chair, which can translate into poor communication among Department members about their achievements, duties, and priorities

Both assessors suggested augmenting the authority of the Chair to address these issues, especially to address the decline in major registrations and course enrolments as well as the renewal of the program requirements and course offerings. Although their recommendation may violate the autonomy of the five agencies and thus would meet with some resistance, Department members agreed with the assessors that the role and authority of the Chair needed to be reviewed. Hence, the reviewers suggested finding new ways to augment the capacity of the Chair to coordinate, plan and administer the Department effectively in order to address the decline in majors and course enrolments as well as the restructuring of the program and renewal of the curriculum.

Additionally, the two assessors both recommended a retreat dedicated to renewing the undergraduate program in light of declining course enrolments and registration of majors. At its February meeting, the Department enthusiastically endorsed this recommendation. Additional areas that need to be considered are:

• Program requirements: Members of the Department agreed that some program requirements may discourage or even prevent some students from registering as Majors or Minors, particularly since many students become aware of the Department relatively late in their degree.
• Curricular matters: Members of the Department agreed that courses need to be rethought to appeal to a new generation of students, increasingly polarized between those with exposure to religion and those without. It was recommended that the Department:
  o Re-evaluate titles and course descriptions
  o Re-evaluate course levels (i.e., 100, 200, 300 and 400-level courses)
  o Offer more opportunities for experiential learning
  o Expand online course offerings
  o Rationalize course offerings (e.g., eliminate courses that have not been taught since the last review, ensure that course scheduling allow students to fulfill program requirements in a timely manner; and review offerings of upper level courses)
  o Respond to the University of Waterloo’s Indigenization Strategy.

Actions
a) The Department will hold a retreat to review and simplify the undergraduate program and curriculum, and to discuss strategies for increasing department visibility on campus.
  b) The Department will request a meeting of the Heads (or their delegates) of the five agencies to discuss, clarify, and agree upon the role and powers of the Chair.
January 2020 Update

a) The Department held two meetings on simplifying the undergraduate program and curriculum. UGAG has already approved simplified Plan changes, renumbering of courses, and removal of a number of dormant courses.

b) The Department has requested a January meeting with the Heads of the five agencies.

2. Increase visibility of the undergraduate program to attract more students (e.g., program to do self-promotion and receive support from the centre such as MUR).

Response
Both the assessors’ reports and the self-study emphasized the need to better publicize the Department, its programs, and its courses.

First, the Department needs to analyze and better understand why the number of majors has dropped so dramatically in the last number of years. Unfortunately, this is not an isolated instance but rather other traditional departments in the Waterloo Faculty of Arts and other universities have experienced similar declines. As Dr. Marshall observed, “We must emphasize that this enrolment trend is not unique to the Waterloo Religious Studies or Faculty of Arts. Both external assessors have seen similar declines in their upper level enrolments over the years.”

Studies have shown that young Canadians are becoming increasingly disconnected from traditional forms of religion and their institutions, and so many have had no direct experience of traditional religion, and hence are uninterested in traditionally defined courses. The Department has already undertaken steps to make itself more visible (e.g., promoting its activities on social media) and to redefine some of its courses to appeal to students.

Actions

a) The Department will hold a retreat to discuss strategies for increasing department visibility on campus (see action #1 above).

b) As the first ‘face’ of the RS Department that students see, editing and continuously updating the RS website is very important. Thus, the Department plans to revise the website in order to: consistently target the typical undergraduate student (17-25 years old, etc.); highlight courses in upcoming terms during pre-enrolment and enrolment periods, making this list (with links to syllabi) one click away from entering the site; underscore the flexibility of the program to encourage students to consider this as a valuable and complementary area of study alongside other areas/majors.

c) The Department will develop and institute a campus communications plan that regularly promotes the Department: focusing especially on maximizing the effectiveness of online tools (social media, Waterloo Learn, etc.), faculty participation in Arts First program in
order to expose students to RS professors, and adding a campus presentation event on undergraduate research in RS.

**January 2020 Update**
The department has revised its web site, although more changes are foreseen. The Administrative Manager and Chair have worked together to improve outreach through various social media platforms (Facebook, Twitter, Instagram).

3. Increase the current administrative staff position from part-time to full-time in order to support students (e.g., fieldwork forms, ethics approvals etc.) and enhance program communication (e.g., advertising for the program such as posters, social media presence etc.).

**Response**
Both external assessors strongly recommended that the Administrative Manager’s position be made full-time (35 hours) rather than the current part-time (30 hours). This would allow the Administrative Manager to:

- Facilitate communication among Department members, among faculty and students, and among the students themselves.
- Organize colloquia, speaker events, and other events to enhance Department visibility and promote departmental goals.
- Promote and publicize RS courses on social media.
- Assist graduate students, helping them with the Research Ethics milestone, etc.

At the February departmental meeting, there was a strong consensus in support of this recommendation. At the same time, it was recognized that the timing of this recommendation could not be worse as the government announcements regarding university tuition fees means that each of the five agencies may resist any additional expenses.

**Actions**

a) The Chair will approach the Heads of the five agencies (see action #2 above) to enquire about the possibility of making the Administrative Manager’s position full-time (35 hours).

4. Ensure field methodology training and ethics approval training are built into the doctoral course offerings. Students interviewed all expressed a feeling of isolation and expressed a need to build connections with sociology and anthropology faculty in order to strengthen their research competencies and for students to mobilize knowledge and training opportunities and better understanding of approaches that would help them shape their thesis proposals.

**Response**

January 2020
There was a consensus among the two assessors’ reports and the self-study regarding requirements for the Laurier-Waterloo Joint Doctoral Program in Religious Diversity in North America. This included exploring courses, workshops, and procedures to ensure that students receive more training in methods (including research ethics training) before beginning their dissertation research stage.

**Action**
a) The Department will approach with Wilfrid Laurier University to address the issues of a course on Methods to be offered in the winter semester as well as ethics approval training.

**January 2020 Update**
The Joint Doctoral Program held a retreat in December 2019 to address this issue. Discussions are ongoing.

5. Better coordination of course offers between AFIW institutions and UW.

**Response**
As observed in the 2011 cyclical review and echoed by the assessors’ reports and the self-study, the most important distortions in the area of course offerings are tied to the attempts of department members to meet the equity level teaching requirements of their respective agencies. This has meant, for example, that various agencies tend to offer large-enrollment classes and avoid low-enrolment, upper-level courses. Consequently, it is necessary to discuss the underlying implications of the teaching equity agreement in order to address these curricular matters.

**Actions**
   a) The Department will request a meeting of the Heads (or their delegates) of the five agencies to come to an agreement around teaching equity levels in Religious Studies in order to empower faculty members to offer courses according to the needs of the program. The Department will ask for clarification and commitments regarding teaching levels in relation to administrative and teaching responsibilities within the agencies. This meeting will also request RS faculty participation in the Arts First program to expose students to professors.

6. Renew efforts at fostering communication, community and collegiality among the doctoral students, between the two institutions, and between the faculty and doctoral students.

**Response**
There was a consensus among the two assessors’ reports and the Self-Study for this recommendation.
Action
a) The Department will approach Wilfrid Laurier University to foster communication, community, and collegiality among the doctoral students, between the two institutions, and between the faculty and doctoral students.

January 2020 Update
The Associate Chair, Graduate Studies, Doris Jakobsh has initiated academic and social events (including dinners for grad students in her own home) to promote collegiality at all levels in the Joint Program.

Initiatives the Program wishes to Implement
The following are recommendations that the program has chosen to include and act upon. A number of these were discussed with the reviewers and included in their reports, but were not listed as concrete recommendations.

1. Renewal of the doctoral program to expand its purview to allow broader participation, partner with other units at Waterloo, and implement an Indigenization plan.

Response
There was a consensus among the two assessors’ reports and the self-study on two points regarding the renewal of the Laurier-Waterloo Joint Doctoral Program in Religious Diversity in North America. These included:

- Broadening the focus of the doctoral program to allow for wider participation among departmental members, e.g., revising its North American focus as well as its emphasis on the social scientific study of religion;
- Exploring the potential for a formal connection of the doctoral program with other Waterloo units (e.g., Peace and Conflict Studies, Classical Studies, etc.).

Moreover, Dr. Marshall introduced an important priority not mentioned in the other reports:
- Making indigenization of the Joint Program a priority by involving Indigenous elders from the community in the program, and by hiring faculty in the area of Indigenous Spirituality.

Actions
a) The Department will facilitate an internal discussion in terms of broadening its purview to open participation to other department members and to begin exploratory discussion with potential Waterloo partners regarding the possibility of expanding the scope of the doctoral program, as well as implementing an Indigenization plan.

b) The Department will hold a joint retreat with its WLU counterpart to review the doctoral
program and to consider an expanded vision moving forward.

January 2020 Update
The Joint Doctoral Program held a retreat in December 2019 to address this issue. There was enthusiasm for expanding the scope of the Joint Doctoral Program.

2. Address the issue of RS faculty complement regarding course releases due to secondments, administrative duties, and teaching in other units; and planning for future retirements, which could represent half of the current faculty complement within the next seven years.

Response
While the two assessors did not discuss the issue of faculty complement at length, the self-study and the discussion at the February 11, 2019 departmental meeting examined the issue thoroughly. There were two main issues identified.

First, although the Department has 13 faculty members, most have course release(s) for administrative duties for the Department, secondments (administrative duties for the four other agencies), and teaching for agency-programs outside of Religious Studies (e.g., Masters of Theological Studies, Conrad Grebel; Masters of Catholic Thought, St. Jerome’s). For example, the three members who teach no RS courses serve as senior administrators in their various institutions. Other members are assigned to teach in Masters programs or other Departments in their agencies. A poll of departmental members conducted in the Winter 2019 semester revealed that only one member was teaching a full course load within RS, one member was on sabbatical, and three members taught no RS courses.

While course releases for the purposes of research may be an issue in the Faculty of Arts, the challenge within the RS Department involves course releases due to administrative duty or teaching in other units. As of Winter 2019, no one is receiving a course release for research purposes.

In any case, in terms of teaching and serving in Departmental roles, the Department is operating on a half-complement. This means that: compared to seven years ago, many more courses are taught by sessional appointments; and ii) the pool of people to serve in departmental roles (Chair, Associate Chair, Director of the Joint Doctoral Program) is very limited, to the point where these roles may not be able to be filled in the near future.

In 2019-2020, Department members will teach 26 Undergraduate RS courses, while course releases due to administration and teaching outside of the Department will total 37.
The second issue has to do with retirements. Approximately six members of the Department will reach retirement age by the time of the next cyclical review in 2025. This will affect teaching in both the undergraduate programs (Religious Studies and Jewish Studies) as well as the Joint Doctoral program. Moreover, these retirements will affect the Department’s ability to fill essential service roles. At the February 11, 2019 Department meeting, members suggested that in the next few years the Chair should review possible retirements and approach the Deans of the five agencies to determine whether these positions will be renewed and, if so, how (that is, in what field of study).

**Actions**

a) The Department will meet with the Heads of the five agencies to negotiate a renewed commitment to Religious Studies that would allow departmental members to teach and perform service in the Waterloo Department of Religious Studies rather than mostly or solely at their respective institutions.

b) The Department will undertake a study of the impact of impending retirements on the undergraduate and doctoral programs, asking each agency for a commitment to replace retiring professors.

3. Address hiring equity issues in the Department.

**Response**

The Department recognizes the serious imbalances in terms of diversity among its members. Following Mavis Fenn’s retirement in July 2018, three of its members are women, which represents only 25 percent, an imbalance that needs to be addressed (45% of Arts professors are women). Moreover, no one in the department is a member of a visible minority (one has an Indigenous heritage). Hence, replacements for retirements should be done with an eye to increasing diversity.

**Action**

a) The Department will meet with the Heads of the five agencies to negotiate a renewed commitment to equity in hiring in Religious Studies.
### Implementation Plan

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Proposed Actions</th>
<th>Responsibility for Leading and Resourcing (if applicable) the Actions</th>
<th>Timeline for addressing Recommendations</th>
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<td>(Acting) Chair; Chair; AFIW Deans or delegates.</td>
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The Department Chair/Director, in consultation with the Dean of the Faculty shall be responsible for the Implementation Plan.
25 January 2020

Professor David DeVidi
Associate VP, Academic
University of Waterloo

Dear Dave,

I am appending a brief decanal response to the Final Assessment Report on Religious Studies. I am supportive of the Department’s wish to move forward with the specific recommendations outlined in their implementation plan. As you know, the Faculty of Arts is currently in a situation that puts constraints on its ability to make immediate financial promises to any unit. Moreover, the equity agreements between the AFIW and the University are complex and challenging. For that very reason, I suspect that they at times present barriers to innovation; it may well be time to examine them in detail, but it will be a lengthy process.

Nevertheless, as the Faculty works towards eliminating its financial deficit, I am open to conversations around forward planning, and am committed to doing whatever I can to put all units on a sound footing. In the case of RS, I’m particularly supportive of enhanced Indigenization of the program, and look forward to working together with our AFIW colleagues towards that goal.

Sincerely,

Sheila Ager
Dean, Faculty of Arts

Cc: David Seljak, Chair, Religious Studies
    Marcus Shantz, President, Conrad Grebel University College
Date of next program review

2024-2025

Date

Signatures of Approval

David Seigal Jan. 15, 2020
Chair/Director Date

Marcus Shantz Jan 23/2020
AFIW Administrative Dean/Head (For AFIW programs only) Date

Faculty Dean

Note: AFIW programs fall under the Faculty of ARTS; however, the Dean does not have fiscal control nor authority over staffing and administration of the program.

Associate Vice-President, Academic
(For undergraduate and augmented programs) Date

Associate Vice-President, Graduate Studies and Postdoctoral Affairs
(For graduate and augmented programs) Date
Date of next program review: 2024-2025

Signatures of Approval

Chair/Director

AFIW Administrative Dean/Head (For AFIW programs only)

Faculty Dean

Note: AFIW programs fall under the Faculty of ARTS; however, the Dean does not have fiscal control nor authority over staffing and administration of the program.

Associate Vice-President, Academic
(For undergraduate and augmented programs)

Associate Vice-President, Graduate Studies and Postdoctoral Affairs
(For graduate and augmented programs)

December 2019