COUNCIL OF THE FACULTY OF SCIENCE

NOTICE OF MEETING
December 13, 2022
3pm – 4:30pm
via Zoom

AGENDA

1. Call to Order and Approval of Agenda
2. Chair’s Remarks
3. Approval of November 8, 2022 Minutes
4. Business Arising
5. Inquiries and Communications
   > November 24, 2022 Senate Synopsis
6. Dean’s Remarks
7. Associate Dean and Head of Bethune College Remarks
8. Reports from Science Representatives on Senate Committees
9. Report from Student Caucus Representative
10. Reports from Standing Committees of Council
    a) Executive Committee:
       > Ratification and Call for Nominations for Senate and Standing Committee of Council
       > Vacancies report on the Standing Committees of FSc Council
    b) Curriculum Committee:
       > consent agenda items
    c) Graduate Curriculum Committee:
       > consent agenda items
11. Other Business
    a) Budget Consultation - Rhonda Lenton, President and Vice-Chancellor, Lisa Philipps, Provost and Vice-President Academic & Carol McAulay, Vice-President Finance & Administration
COUNCIL OF THE FACULTY OF SCIENCE

MINUTES

November 8, 2022
3pm – 4:30pm
LUM 306 & Zoom

MINUTES

1. Call to Order and Approval of Agenda
   T. Kirchner, Chair of Council called the meeting to order and a motion was moved, seconded and carried to approve the Agenda as presented.

2. Chair’s Remarks
   T. Kirchner welcomed council to the first hybrid meeting and explained how the hybrid meeting works with the OWL system.

3. Approval of October 11, 2022 Minutes
   A motion was moved, seconded and carried to approve the Minutes.

4. Business Arising
   There was none.

5. Inquiries and Communications
   > October 27, 2022 Senate Synopsis
   Council members noted the Senate Synopsis of meeting held on October 27, 2022.

6. Dean’s Remarks
   G. Audette on behalf of the of Dean Wang presented the following:

   Highlights:
   Community 2022 website officially launched today and encouraged committee members to follow their calendar to stay up to date about upcoming events. The next event is the York Science Social scheduled for Tuesday, November 22 at 2pm – 4pm in the New Student Centre.

   Allan I Carswell Observatory and the School of the Arts, Media, Performance and Design (AMPD) are organizing a Halloween Astronomy Extravaganza: Lecture, Music Concert, and Telescopes, Oh My! on October 31.

   Congratulations:
   York Research Chairs – Jianhong Wu (Tier 1) and Jane Heffernan (Tier 2).

   Jane Heffernan (Math & Stats) was elected Vice-President of the Society for Mathematical Biology, and will become the Society’s President in July 2023.

   Christine Le (Chemistry) received the 2022 Petro-Canada Emerging Innovator Award.
Sandra Rehan and Sapna Sharma (Biology) were elected to the Royal Society of Canada College of New Scholars, Artists & Scientists.

Bridget Stutchbury (Biology) was named as one of five finalists in the Canadian Museum of Nature’s Nature Inspiration Awards.

Jianhong Wu (Math & Stats) was elected as a Fellow of the Royal Society of Canada and as a Fellow of the Canadian Academy of Health Sciences.

7. **Associate Dean and Head of Bethune College Remarks**

   **Associate Dean Faculty Affairs, G. Audette:**

   Sabbatical Reports were due November 1, 2022 (per Article 20.05 of the Collective Agreement). If you’ve not yet submitted your report, please do so.

   Annual CV and Outside Activities Exercise is ongoing, deadline to submit is November 25, 2022.

   Retirement plans? If you are considering retirement, please reach out to me to discuss as soon as possible.

   We currently have seventeen (17) on-going faculty searches. All searches have been advertised, and we have one at the shortlist stage.

   **G. Audette on behalf of Associate Dean Students, M. Scheid:**

   The IT Roundtable Open Forum for Faculty of Science is scheduled for November 21, 2022, in Lumbers 306.

   Use of the Attending Physician’s Statement (APS) is still suspended. Students do not have to provide an APS if they are absent from tests/assignments due to illness.

   **Associate Dean Curriculum and Pedagogy, H. Kouyoumdjian:**

   A luncheon for new faculty members is scheduled for Wednesday, November 9. The goal for the luncheon is for new faculty to have a time to get to know each other, learn about resources related to teaching & learning in the Faculty of Science, and build community.

   Semester-end debrief is planned for Thursday, December 15, 2022 at 12:00pm – 1:30pm. This event will feature conversations with instructors about teaching in their in-person classrooms, “lessons learned”, and dedicated time to discuss the classroom challenges. This event will be open to all who teach at our faculty.

   **Associate Dean Research & Partnerships, V. Saridakis:**

   York University Minor Research Grant is open, faculty members are encouraged to apply by the November 15 deadline.

   Faculty of Science Research Award nominations are due this week.

   CFI-IOF information will be sent to faculty soon.

   USRA & ENURA are approaching, we will be seeking research project summaries soon for the website.
If you are interested in submitting a CFI-JELF application in February, please contact Vivian Saridakis or Jerusha Lederman.

YUFA MRG and JFF competitions are just around the corner. More information will be released soon.

8. Reports from Science Representatives on Senate Committees
G. Audette gave a Senate Executive update regarding the University disruption, there may be a decision made next week to end the disruption.

9. Report from Student Caucus Representative
Ali Bashar introduced himself and Ahmer Mohiuddin as the caucus coordinators. The SSC hopes to continue to build relationships with the faculty and engage with the student community with events. The SSC is working on filling the remaining standing committee vacancies, with hopes of finalizing memberships by the end of the week.

10. Reports from Standing Committees of Council
a) Executive Committee:
   > Ratification and Call for Nominations for Senate and Standing Committee of Council
      A motion was moved, seconded and carried to ratify all nominations to the Standing Committees of Council.
   > Vacancies report on the Standing Committees of FSc Council
      T. Kirchner noted the vacancies that remain.

b) Curriculum Committee:
   > consent agenda items

11. Other Business
a) VPRI Strategic Research Plan – Amir Asif, Vice-President Research & Innovation
   Amir Asif gave a presentation on the 2023 – 2028 Strategic Research Plan. Council members were encouraged to ask questions, and reach out to Amir directly if they had additional questions.

Meeting Adjournment
A motion was moved, seconded and carried to adjourn the meeting.
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<td>Sibonile Siyatshana</td>
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The Senate of York University

Synopsis

The 690th Meeting of Senate held on Thursday, 24 November 2022
via Zoom

Remarks

The Chair of Senate, Professor Mario Roy of Glendon College, welcomed Senators to the meeting.

On behalf of Senate, the Chair thanked Assistant Secretary of the University Kathryn White who is moving to a new position at the Council of Ontario Universities.

President Rhonda Lenton spoke to the Auditor General’s Special Report on Laurentian University noting its implications for the province’s university sector. The Council of Ontario Universities (COU) is analyzing the report and the set of recommendations issued within it, and discussing them with university Executive Heads. There is agreement among the universities on the value of preserving institutional autonomy. The Ministry of Colleges and Universities (MCU) is responding to the special report in part by developing a set of eight financial sustainability metrics to be incorporated into the government’s new performance-based funding model. COU is providing input to the Ministry on the metrics.

In response to questions from Senators, President Lenton emphasized that:

- the primary causes of the challenges at Laurentian are not ones confronting York
- the academic leadership and the Board of Governors are prudently taking up the opportunity to review the recommendations from the Auditor General’s report, and will concurrently examine the University’s policies and practices to ensure our governance and planning processes are sound and grounded in risk mitigation, particularly around capital project planning and academic program sustainability

The President also spoke to masking on campus, noting that the community is strongly recommended to return to the use of masks in indoor settings.

The monthly “Kudos” report on the achievements of members of the York community can be accessed with other documentation for the meeting.
The Senate of York University Synopsis

Inquiries and Communications

Speaking to the written report included in the agenda, the Academic Colleague to the COU, Senator William van Wijngaarden, reported on its October meetings in which members engaged in a focused discussion of the benefits, challenges and considerations of online learning. The Academic Colleagues also received updates on current COU activities and priorities, including its response to the government’s establishment of an expert panel on the postsecondary sector.

Reports

Under the auspices of the Academic Policy, Planning and Research Committee (APPRC) Senate received the Provost’s autumn report on complement and enrolments.

Approvals

Senate approved the recommendation of its Executive Committee to:

• extend the waiver of required Attending Physician Statements to support requests for deferred standing, petitions and appeals to 31 December 2023, with final report/recommendation on its status to Senate by November 2023.

Senate approved the recommendation of its Academic Policy, Planning and Research Committee to:

• charter the following Organized Research Units for a five-year period, effective 1 July 2023 – 30 June 2028:

  Manufacturing Technology Entrepreneurship Centre (1 July 2022–30 June 2027)
  Mobility Innovation Centre
  LaMarsh Centre for Child and Youth Research
  Centre for Research on Language and Culture Contact
  Nathanson Centre on Transnational Human Rights, Crime & Security
  The Robarts Centre for Canadian Studies

Senate approved the recommendations of its Academic Standards, Curriculum and Pedagogy Committee to:

• establish MA and PhD programs in Global Health in the School of Global Health, Faculty of Health, effective FW2023-2024

• approve in principle, with an effective date to be recommended in due course:

  • The phased implementation of the new grading schemes, whereby phase 1 comprises the translation of GPAs to the 4.0 scheme with the additional
The Senate of York University Synopsis

academic standing elements of the Policy on York University Grading Schemes to be implemented in conjunction with the new Student Information System;

- revisions to and the change in the name of the Common Grading Scheme for Undergraduate Faculties Policy to the Pan-University Grading Schemes Policy; and

- revisions to Progression Requirements to Maintain Honours Standing and Progression Requirements to Maintain Honours Standing in Bachelor of Engineering

Committee Information Reports

Executive Committee

Information items included the following:

- its approval of Senate Committee student members nominated by the Student Senator caucus
- its review of the membership of Senate for the 2023-2025 period, with a recommendation to come to Senate in the winter term
- Confirmation that there will be a meeting of Senate held in December, on 15 December

Academic Policy, Planning and Research Committee (APPRC)

On behalf of the Committee, the Chair shared updates on the information items outlined in the written report, highlighting the Committee’s priorities and initiatives in progress.

Academic Standards, Curriculum and Pedagogy Committee (ASCP)

ASCP provided Notice of Statutory Motion for the establishment of the degree type Master of Health Industry Administration, Schulich School of Business.

On behalf of the Committee, the Chair noted the series of minor modifications to curriculum approved by the Committee.

Additional Information about this Meeting

Please refer to the full Senate agenda and supplementary material posted online with the 24 November 2022 meeting for details about these items.

https://www.yorku.ca/secretariat/senate/meeting-agendas-and-synopses/

December Meeting of Senate

Senate’s next meeting will be held at 3:00 pm on Thursday, 15 December 2022.
RATIFICATION OF NOMINATIONS

Executive Committee 2022-23

Senates
Madeline Blanco (term until 2024)
Yashna Mahek (term until 2023)

Graduate Student Nominations for 2022-2023 Faculty Council
Olga Andriyevska (term until 2023)

Executive Committee:
Taline Apelian-Sutor (term until 2023)

Academic Policy and Planning Committee:
Areeba Chaudhry (term until 2023)

Petitions Committee:
Claire Del Zotto (term until 2023)
Sameen Ali (term until 2023)

Committees on Examinations and Academic Standards:
Jarred Laganas (term until 2023)
Zahra Rafi (term until 2023)

Appeals Committee:
Ebadullah Kabir (term until 2023)
Julia Tersigni (term until 2023)

Undergraduate Curriculum Committee:
Stephanie Sansone (term until 2023)
Elana Dhaigham (term until 2023)

Committee on Teaching and Learning:
Sarah Damiani (term until 2023)

Committee on Tenure and Promotions:
Ali Basher (term until 2023)

Committee on Research and Awards:
Aleeza Qayyum (term until 2023)
Committee on Equity, Diversity & Inclusion:
Ayesha Ahmad (term until 2023)
Olga Andriyevska (term until 2023)
## Senate

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<tr>
<th>Roles of Senate</th>
<th>Meeting time / Membership</th>
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<tr>
<td>Chair of Council</td>
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### Senate Executive

- **Senator Ex-officio**: R. Wang
- **Student representative**: Madeleine Blanco
- **Member at Large**: T. Kirchner
- **Chair of Council**: T. Kirchner
- **Faculty Council**: Chair of Council
- **FSc Reps on Senate Committees**: 1 member from FSc
- **Standing Committees**: ASCP (Academic Standards, Curriculum and Pedagogy Committee), Academic Policy, Planning and Research Committee (APPRC), Undergraduate Curriculum Committee

### Faculty Council

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<td>Dean, Office of STS</td>
<td>3 pm - 4:30 pm</td>
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### Staff Representatives

- **Chair of Council**: T. Kirchner
- **Vice-Chair of Council**: K. Kouyoumdjian
- **Dean Office**: T. Kirchner
- **Member at Large**: VACANT
- **Chair of Council**: T. Kirchner
- **Dean Office**: T. Kirchner
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- **Chair of Council**: T. Kirchner
- **Dean Office**: T. Kirchner
- **Member at Large**: VACANT

### Academic Policy and Planning Committee (APPC)

- **Chair of Council**: T. Kirchner
- **Dean Office**: T. Kirchner
- **Member at Large**: VACANT
- **Chair of Council**: T. Kirchner
- **Dean Office**: T. Kirchner
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- **Member at Large**: VACANT

### Undergraduate Curriculum Committee

- **Chair of Council**: T. Kirchner
- **Dean Office**: T. Kirchner
- **Member at Large**: VACANT

### Members of the Senate

- Dean, Office of STS: T. Kirchner
- Member at Large: VACANT

### Faculty Representation

- **Chair of Council**: T. Kirchner
- **Dean Office**: T. Kirchner
- **Member at Large**: VACANT

### Senate Rules

- The Senate Rules of Council shall be chaired by the Chair of Council and include the Dean of the Faculty of Science, the Dean of the Faculty of Arts, and one member elected from the Senate of Biology, Chemistry, Mathematics & Statistics, Physics & Astronomy, and Science and Technology Studies/Natural Science, one student member of Council, and one of the staff members elected to Council.

### Executive Committee

- **Chair of Council**: T. Kirchner
- **Dean Office**: T. Kirchner
- **Member at Large**: VACANT
- **Chair of Council**: T. Kirchner
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### APPC

- **Chair of Council**: T. Kirchner
- **Dean Office**: T. Kirchner
- **Member at Large**: VACANT

### Undergraduate Curriculum Committee

- **Chair of Council**: T. Kirchner
- **Dean Office**: T. Kirchner
- **Member at Large**: VACANT
The Committee on Examinations and Academic Standards shall consist of an Associate Dean (ex officio), five members elected by Council from each of Biology, Chemistry, Mathematics & Statistics, Physics & Astronomy and Science and Technology Studies/Natural Science, and one student member of Council. CEAS will normally meet every alternate Wed. / Thurs from 12:00 - 1:30 pm year round.

In addition to the above membership of the committee, Council shall elect an alternate member from each of the Departments specified above. The alternate member shall be the person polling the next highest number of votes to those elected to the committee from each Department. The alternate for the student member will be selected by the Science Student Caucus from one of its Members at Large. An alternate can only vote in the event that first elected members are not in attendance.

### CEAS

- **Associate Dean - Students, ex officio**: M. Scheid
- **Undergraduate Student Rep**: Keely Kuhl
- **Graduate Student Rep**: L. Mortensen
- **Chemistry**: D. Metzler / ALT. F. Petkowska
- **Math & Stats**: A. Moore, N. Doolittle, A. Van Ess
- **Physics & Astronomy**: Committee A: T. Orchard (Fall) | Committee B: E. Orchard (Winter)
- **Computer Science**: Committee A: E. Hyde (Winter) | Committee B: Randy Lewis (Winter)
- **STIS**: J. Elwick / ALT. P. Potvin

### Petitions

The Committee on Teaching and Learning shall consist of one currently tenured faculty member from each of Biology, Chemistry, Mathematics & Statistics, Physics & Astronomy and Science and Technology Studies/Natural Science elected by Council and one student member of Council. 

- **Committee A**: S. Jerzak (Fall) | **Committee B**: G. Orchard (Fall)
- **Biology**: E. Hyde / ALT. Jason Paul Pauvert
- **Chemistry**: T. Li / ALT. T. Li
- **Physics & Astronomy**: D. Metzler / ALT. F. Petkowska
- **Math & Stats**: D. Liang / ALT. Jianhong Wu

### SRC T & P Committee

- **Associate Dean - Faculty, ex officio**: M. Scheid
- **Graduate Student**: M. Baecher
- **Biology**: E. Hyde / ALT. E. Hyde (Fall)
- **Chemistry**: W. Li / ALT. W. Li (Winter)
- **Physics & Astronomy**: V. Gao / ALT. Jianhong Wu
- **Math & Stats**: Y. Gao / ALT. Jianhong Wu

### CoTL

- **Associate Dean - Students, ex officio**: M. Scheid
- **Graduate Student Representative**: N. Gregson
- **Graduate Student Representative**: A. Kwan
- **Undergraduate Student Representative**: S. Damiani
- **IEEE/CEAS**: H. Kowda / ALT. S. C. Lavoie
- **Undergraduate Representative**: J. Atallah
- **Graduate Representative**: E. Kabir
- **Biology**: S. Tang
- **Chemistry**: D. Liang
- **Physics & Astronomy**: T. Zhu
- **Math & Stats**: J. Wu

### Committee on Research & Awards

The Committee on Research and Awards shall consist of one member elected by Council from each of Biology, Chemistry, Mathematics & Statistics, Science and Technology Studies/Natural Science, and Physics & Astronomy, one student member of Council and an Associate Dean (ex officio).

- **Associate Dean - Research & Partnerships, ex officio**: K. Hudak / ALT. J. Atallah
- **Graduate Student Representative**: Y. Song
- **Graduate Student Representative**: S. Damiani
- **Biology**: E. Kabir
- **Chemistry**: A. Kwan
- **Physics & Astronomy**: S. Tang
- **Math & Stats**: J. Wu

### Appeal Committee

The Appeal Committee for the purpose of hearing student appeals shall consist of four elected faculty members from Science units, an Associate Dean (ex officio) and two student members of Council. A quorum shall consist of either (a) two faculty members and one student member or (b) three faculty members.

Committee on Research & Awards

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<td>Math &amp; Stats</td>
<td>2022-2023</td>
</tr>
</tbody>
</table>

The Research & Awards Committee will meet when grants and awards need to be adjudicated.

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Term</th>
</tr>
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<tbody>
<tr>
<td>Biology</td>
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<tr>
<td>Math &amp; Stats</td>
<td>2022-2023</td>
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<tr>
<td>Math &amp; Stats</td>
<td>2022-2023</td>
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</tr>
<tr>
<td>Math &amp; Stats</td>
<td>2022-2023</td>
</tr>
</tbody>
</table>

The Committee on Teaching and Learning shall normally meet every third Thursday of each month (September to May) from 10:00 am - 11:30 am in LMU 350B.

The Petitions Committee for the purpose of hearing student petitions shall consist of an Associate Dean (ex officio), six members of Council, and two student members of Council. The Committee may divide the workload by splitting the Committee membership into two panels of four people each. A quorum shall consist of either (a) two faculty voting faculty members and one student member or (b) three voting faculty members. Each panel meets once a month on Wednesday or Thursday from 2:30 pm - 4:00 pm.
## Graduate Curriculum Committee

The Graduate Curriculum Committee provides broad review and commendation to Council via the Academic Policy and Planning Committee of all proposals received from Graduate Programs with respect to: New Course Proposals, Course Change Proposals, Minor Changes to Program/Graduate Diploma Academic Requirements, Major Modifications to Program/Graduate Diploma Academic Requirements, New Graduate Fields, New Graduate Diplomas, New Graduate Degree Programs.

The Graduate Curriculum Committee shall consist of:
- Associate Dean - Research & Graduate Education (ex officio)
- Graduate Program Director (or designate who must be a member of the graduate program) of each Graduate Program in the Faculty of Science
- One graduate student member from any Graduate Program within the Faculty of Science
- One full-time faculty member from the Faculty of Health or Lassonde School of Engineering who is appointed to teach in any FSc graduate program
- A member at large with knowledge of graduate programming, and experience with curriculum approvals at the Faculty-level.

The Chair of the Committee is selected by the voting members of the Committee for a one-year term.

<table>
<thead>
<tr>
<th>Name</th>
<th>Designation</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>M. Scheid</td>
<td>Biology</td>
<td>2020</td>
<td>2023</td>
</tr>
<tr>
<td>B. Stutchbury</td>
<td>Chemistry</td>
<td>2022</td>
<td>2025</td>
</tr>
<tr>
<td>R. McLaren</td>
<td>Physics &amp; Astronomy</td>
<td>2020</td>
<td>2023</td>
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<td>S. Moghadas</td>
<td>Math &amp; Stats</td>
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<td>Member from Faculty of Health OR Lassonde</td>
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<td>2024</td>
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</tr>
<tr>
<td>Farnaz Mansouri-Noori</td>
<td>Graduate student</td>
<td>2022</td>
<td>2025</td>
</tr>
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## Committee on Equity, Diversity & Inclusivity (EDI)

The purpose of the Committee on Equity, Diversity & Inclusivity is to provide broad review and leadership to Council on matters of Equity, Diversity and Inclusivity issues with respect to:
- Tenure and Promotions
- Hiring and Retention of members from EDI groups
- Approaches to addressing gender bias in the workplace
- Research engaging equity recognized groups
- Workload and service contributions of EDI members
- EDI experiences in Teaching and Learning

The Equity, Diversity and Inclusivity committee shall consist of:
- Associate Dean, Faculty Affairs (ex officio)
- Associate Dean, Research & Graduate Education (ex officio)
- One primary and one alternate member from each of Biology, Chemistry, Mathematics & Statistics, Physics & Astronomy and Science & Technology Studies.
- Two graduate students or postdoctoral fellow/visitors (one primary and one alternate) from any graduate program within the Faculty of Science
- One undergraduate student

The Chair of the Committee on Equity, Diversity & Inclusivity is selected by the voting members of the Committee for a one-year term.

<table>
<thead>
<tr>
<th>Name</th>
<th>Designation</th>
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<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>G. Audette</td>
<td>Associate Dean - Faculty, ex officio</td>
<td>2022</td>
<td>2025</td>
</tr>
<tr>
<td>V. Saridakis</td>
<td>Associate Dean, Research &amp; Partnerships (ex officio)</td>
<td>2022</td>
<td>2025</td>
</tr>
<tr>
<td>Ayesha Ahmad</td>
<td>Undergraduate Student Representative</td>
<td>2022</td>
<td>2023</td>
</tr>
<tr>
<td>Olga Andriyevska</td>
<td>Graduate Student</td>
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<td>2023</td>
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<tr>
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<tr>
<td>C. Li</td>
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<td>S. Harris</td>
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<td>V. Pavri</td>
<td>STS</td>
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<tr>
<td>T. Petti</td>
<td>2020</td>
<td>2023</td>
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</tr>
</tbody>
</table>
The Faculty of Science Curriculum Committee has reviewed proposals for changes to course information and degree requirements and recommends to the Executive Committee that the following changes be submitted to Council for approval.

Details regarding these proposals (and other minor changes to Calendar/Repository course descriptions and prerequisites which were approved by the Committee but are not reported here) are included in the working papers of November 29, 2022, meeting of the Curriculum Committee, which are on file for your inspection in the Office of the Dean, with all members of the Curriculum Committee or by contacting the Secretary of the Committee at scicurri@yorku.ca

1) BIOLOGY
a) Changes to Existing Course form for BIOL 4700 3.0
b) Change in Minor Modification to Biology Degree requirements: addition of SC/Biol 4005 3.0 to BSc. Biology Honours Programs in Biology

2) CHEMISTRY
a) Change in minor modification: BSc. Chemistry program – minor change to wording of major requirements to clarify language (submitted by Derek Jackson)

3) MATHEMATICS AND STATISTICS
a) New Course: SC/MATH 4940 3.0 – Perturbation Methods - (submitted by lain Moyles via Hovig)
b) Change in course credit exclusion (CCE): MATH 1013 3.0, 1014 3.0 1300 3.0, 1310 3.0, 1530 3.0, 1540 3.0 and 1550 3.0 - (submitted by Susy Ribeiro)

4) NATURAL SCIENCE
a) Change in Title, Calendar Description, Course Format/mode of delivery and Course Credit Exclusion: SC/NATS 1650 6.0 – Human Anatomy for the Fine Arts
b) New Course: SC/NATS 1755 3.0 – Natural Hazards
c) Change in course format/mode of delivery: SC/NATS 1610 6.0 – The Living Body – LECT to LECT, BLEN
d) Change in course format/mode of delivery: SC/NATS 1670 6.0 – Concepts in Human Health and Disease – LECT, ONLN, ONCA to LECT, ONLN, ONCA, BLEN
e) Change in course format/mode of delivery: SC/NATS 1940 6.0 – Biodiversity and Conservation – LECT to LECT, ONLN, ONCA, BLEN
f) Change in course format/mode of delivery: SC/NATS 1920 6.0 – Nature and Growth of Ideas in Mathematics – LECT to LECT, ONCA
g) Change in course credit exclusions: SC/NATS 1570 3.0 – Exploring the Solar System
h) Change in NCR and CCE clean-up: SC/NATS 1750 6.0 – The Earth and its Atmosphere
i) Change in format/mode of delivery: SC/NATS 1505, 1530, 1565, 1570, 1670, 1675, 1700, 1730, 1740, 1745, 1750, 1775, 1780, 1840, 1870, 1880 – LECT, BLEN (NATS 1530, NATS 1670), ONLN to LECT, BLEN (NATS 1530, NATS 1670), ONLN, ONCA

5) NEUROSCIENCE
a) Change in Minor modification: adding BIOL 2060 to calendar copy (submitted by Susy Ribeiro)

6) GEOGRAPHY
a) Closure of BSc. Geography program (submitted by Associate Dean of Curriculum & Pedagogy Prof. Hovig Kouyoumdjian)

7) PHYSICS AND ASTRONOMY
a) Change in pre-requisites: SC/PHYSICS 4270 3.0 – Astronomical
b) New course: SC/PHYSICS 3600 3.0 – Experiential Learning Opportunity Through Research and Exchange (EXPLORE)
c) Change in minor modification: Biophysics Specialized Honours Program – addition of new course SC/PHYS 4030 3.00 to list of upper-year PHYS COURSES options. (submitted by Prof. Matthew George)

8) SCIENCE, TECHNOLOGY & SOCIETY
a) Change in course format/mode of delivery: SC/STS 2222 3.0 – Exploring Gender in STEM - adding alternative delivery modes in the Fall, Winter and Summer semesters – in addition to LECT, adding ONLN, ONCA and BLEN
b) Change in course format/mode of delivery: SC/STS 2010 3.0 – History of Modern Science - adding alternative delivery modes in the Fall, Winter and Summer semesters - in addition to LECT, adding ONLN, ONCA and BLEN
c) Change in course format/mode of delivery: SC/STS 3561 3.0 – From the Abacus to Artificial Intelligence: How the Computer Came to Be - adding alternative delivery modes in the Fall, Winter and Summer semesters - in addition to LECT, adding ONLN, ONCA and BLEN
d) Change in course format/mode of delivery: SC/STS 2210 – Technology in the Modern World – LECT to ONLN, ONCA and BLEN
e) Change in course format/mode of delivery: SC/STS 2411 – Exploring Science, Technology and Society – LECT to ONLN, ONCA and BLEN
f) Change in course format/mode of delivery: SC/STS 2333 3.0 – Science, Technology and Racial Social Justice – LECT to ONLN, ONCA and BLEN
g) Change in course format/mode of delivery: SC/STS 3730 3.0 – Science, Technology and Modern Warfare – LECT to ONLN, ONCA and BLEN
h) Change in title, calendar description, degree credit exclusion (CCE): SC/STS3760 3.0 – Nature, Knowledge and New Worlds, 1500-1800

i) Change in title: SC/STS 4090 3.0 – Science in the Wild: Laboratory Studies and Ethnography

(submitted by Associate Dean Curriculum & Pedagogy Hovig Kouyoumdjian on behalf of Vera)
## Changes to Existing Course

**Faculty:** FSc  
**Department:** Biology  
**Date of Submission:** November 2022  
**Course Number:** BIOL 4700 3.0  
**Effective Session:** Fall 2023  
**Course Title:** Current Topics in Environmental Biology

### Type of Change:

- [ ] in pre-requisite(s)/co-requisite(s)  
- [x] in course number/level  
- [ ] in credit value  
- [ ] in title (max. 40 characters for short title)  
- [ ] in Calendar description (max. 40 words or 200 characters)  
- [ ] other (please specify):

### Change From:

(Crosslisted to: SC/ENVB 4700 3.00)

**Course Description:**

A review of recent advances in environmental biology with an emphasis on current research, experimental design and biological methods. Prerequisites: SC/BIOL 2050 4.00 and SC/BIOL 2060 3.00.

### To:

(Crosslisted to: SC/ENVB 4700 3.00)

**Course Description:**

A review of recent advances in environmental biology with an emphasis on current research, experimental design and biological methods. Prerequisites: SC/BIOL 2050 4.00 and SC/BIOL 2060 3.00.

**Course credit exclusions:** GEOG 4800 3.0.
Rationale: The newly proposed course (GEOG 4800 3.0) will list SC/BIOL 4700 3.0 as a course credit exclusion. This update indicates this reciprocal CCE for SC/BIOL 4700 3.0.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised ‘Course Design’ and ‘Method of Instruction’ information.
Proposal For Minor Modifications to Biology Degree Requirements

1. **Program:** BSc Honours Programs in Biology

2. **Degree Designation:**
   - BSc Biology Hons. Specialized (Biomedical Science stream)
   - BSc Biology Hons. Major Program (Biomedical Science Stream)
   - BCs Biology Hons. Major/Minor Program (Biomedical Science Stream)
   - International BSc Biology Hons. Major Program (Biomedical Science Stream)
   - International BSc Biology Hons. Major/Minor Program (Biomedical Science Stream)

3. **Type of Modification:** Addition of SC/BIOL 4005 3.0 as an approved course for the following:
   - BSc Biology Hons. Specialized (Biomedical Science stream)
   - BSc Biology Hons. Major Program (Biomedical Science Stream)
   - BCs Biology Hons. Major/Minor Program (Biomedical Science Stream)
   - International BSc Biology Hons. Major Program (Biomedical Science Stream)
   - International BSc Biology Hons. Major/Minor Program (Biomedical Science Stream)

4. **Effective Date:** Fall 2023

5. **Provide a general description of the proposed changes to the program.**

Addition of SC/BIOL 4005 3.0 (The Scientific Method: Applications and Controversies) to the list of approved courses for the Biomedical Sciences stream.

**Provide the rationale for the proposed changes.**

SC/BIOL 4005 3.0 is being offered for the first time in Fall 2022 and is not yet listed as an approved course for the Biomedical Sciences Stream.

6. **Describe any resource implications and how they are being addressed.** There are no resource implications associated with this change.
7. Provide as an appendix a side-by-side comparison of the existing and proposed program requirements as they will appear in the Undergraduate or Graduate Calendar.

<table>
<thead>
<tr>
<th>Current Calendar Copy</th>
<th>Proposed Calendar Copy</th>
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<tbody>
<tr>
<td><strong>Honours Programs</strong></td>
<td><strong>Honours Programs</strong></td>
</tr>
<tr>
<td><strong>SPECIALIZED HONOURS PROGRAM</strong></td>
<td><strong>SPECIALIZED HONOURS PROGRAM</strong></td>
</tr>
<tr>
<td>Students may follow a stream in biology, biomedical science or biotechnology.</td>
<td>Students may follow a stream in biology, biomedical science or biotechnology.</td>
</tr>
<tr>
<td><strong>A. General education:</strong></td>
<td><strong>A. General education:</strong></td>
</tr>
<tr>
<td>• non-science requirement: 12 credits;</td>
<td>• non-science requirement: 12 credits;</td>
</tr>
<tr>
<td>• mathematics: SC/MATH 1506 3.00 and SC/MATH 1507 3.00, or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00;</td>
<td>• mathematics: SC/MATH 1506 3.00 and SC/MATH 1507 3.00, or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00;</td>
</tr>
<tr>
<td>• computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;</td>
<td>• computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;</td>
</tr>
<tr>
<td>• foundational science: one of SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00); SC/PHYS 1410 6.00; SC/PHYS 1420 6.00; SC/PHYS 1010 6.00; SC/ISCI 1310 6.00; SC/PHYS 1411 3.00 and SC/PHYS 1412 3.00; SC/PHYS 1421 3.00 and SC/PHYS 1422 3.00; SC/PHYS 1011 3.00 and SC/PHYS 1012 3.00; SC/ISCI 1301 3.00 and SC/ISCI 1302 3.00. Note that the biomedical science and</td>
<td>• foundational science: one of SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00); SC/PHYS 1410 6.00; SC/PHYS 1420 6.00; SC/PHYS 1010 6.00; SC/ISCI 1310 6.00; SC/PHYS 1411 3.00 and SC/PHYS 1412 3.00; SC/PHYS 1421 3.00 and SC/PHYS 1422 3.00; SC/PHYS 1011 3.00 and SC/PHYS 1012 3.00; SC/ISCI 1301 3.00 and SC/ISCI 1302 3.00. Note that the biomedical science and</td>
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</tbody>
</table>
biotechnology streams require specific courses (see below).

**B. Major requirements:**

**Biology Stream**
- The program core, as specified above (24 credits);
- SC/BIOL 4000 8.00 or SC/BIOL 4000 3.00;
- additional credits from biology (SC/BIOL) courses, as required for an overall total of at least 68 credits from biology (SC/BIOL) courses, including at least 18 credits at the 3000 or higher level, of which at least 12 credits are at the 4000 level.

**Biomedical Science Stream**
- SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00;
- one of SC/PHYS 1410 6.00; SC/PHYS 1420 6.00; SC/PHYS 1010 6.00; SC/ISCI 1310 6.00; SC/PHYS 1411 3.00 and SC/PHYS 1412 3.00; SC/PHYS 1421 3.00 and SC/PHYS 1422 3.00; SC/PHYS 1011 3.00 and SC/PHYS 1012 3.00; SC/ISCI 1301 3.00 and SC/ISCI 1302 3.00; HH/PSYC 1010 6.00;
- SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00; SC/BIOL 2020 3.00; SC/BIOL 2021 3.00; SC/BIOL 2040 3.00; SC/BIOL 2060 3.00; SC/BIOL 2070 3.00; Note students intending to take physiology courses must also complete SC/BIOL 2030 4.00;
- SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00;

**Biology Stream**
- The program core, as specified above (24 credits);
- SC/BIOL 4000 8.00 or SC/BIOL 4000 3.00;
- additional credits from biology (SC/BIOL) courses, as required for an overall total of at least 68 credits from biology (SC/BIOL) courses, including at least 18 credits at the 3000 or higher level, of which at least 12 credits are at the 4000 level.

**Biomedical Science Stream**
- SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00;
- one of SC/PHYS 1410 6.00; SC/PHYS 1420 6.00; SC/PHYS 1010 6.00; SC/ISCI 1310 6.00; SC/PHYS 1411 3.00 and SC/PHYS 1412 3.00; SC/PHYS 1421 3.00 and SC/PHYS 1422 3.00; SC/PHYS 1011 3.00 and SC/PHYS 1012 3.00; SC/ISCI 1301 3.00 and SC/ISCI 1302 3.00; HH/PSYC 1010 6.00;
- SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00; SC/BIOL 2020 3.00; SC/BIOL 2021 3.00; SC/BIOL 2040 3.00; SC/BIOL 2060 3.00; SC/BIOL 2070 3.00; Note students intending to take physiology courses must also complete SC/BIOL 2030 4.00;
- SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00;
• SC/Biol 4000 8.00 or SC/Biol 4000 3.00;
• a minimum of nine credits chosen from the following courses: SC/Biol 3060 4.00; SC/Biol 3070 4.00; SC/Biol 3110 3.00; SC/Biol 3130 3.00; SC/Biol 3150 4.00; SC/Biol 3155 3.00; SC/Biol 4010 3.00;
• within the 68 biology (SC/Biol) credits, at least 18 credits must be at the 3000 level or higher, of which at least 12 credits must be at the 4000 level. This must also include a minimum of seven credits from 3000 level or higher biology
(SC/BIOL) courses with an associated laboratory component.

### Biotechnology Stream

- **SC/CHEM 1000 3.00** and **SC/CHEM 1001 3.00**; **SC/PHYS 1410 6.00**;
- one of **SC/PHYS 1410 6.00**, **SC/PHYS 1420 6.00**, **SC/PHYS 1010 6.00**, **SC/ISCI 1310 6.00**, **SC/PHYS 1411 3.00** and **SC/PHYS 1412 3.00**, **SC/PHYS 1421 3.00** and **SC/PHYS 1422 3.00**, **SC/PHYS 1011 3.00** and **SC/PHYS 1012 3.00**, **SC/ISCI 1301 3.00** and **SC/ISCI 1302 3.00**.
- one of **AP/PHIL 2070 3.00** or **AP/PHIL 2075 3.00** (this course will count towards the non-science requirement in the General Education component);
- **SC/BIOL 1000 3.00** and **SC/BIOL 1001 3.00**, **SC/BIOL 2020 3.00**, **SC/BIOL 2021 3.00**, **SC/BIOL 2040 3.00**, **SC/BIOL 2060 3.00**, **SC/BIOL 2070 3.00** and both **SC/CHEM 2020 3.00** and **SC/CHEM 2021 3.00**;
- **SC/CHEM 2080 4.00**, **SC/CHEM 3070 3.00** or **SC/CHEM 3071 3.00**, **SC/CHEM 4050 3.00**, **SC/CHEM 3080 4.00**;
- **SC/BIOL 3100 2.00**, **SC/BIOL 3110 3.00**, **SC/BIOL 3130 3.00**, **SC/BIOL 3140 4.00**, **SC/BIOL 3150 4.00**;
- **SC/BIOL 4000 8.00** or **SC/BIOL 4000 3.00**, **SC/BIOL 4290 4.00**;
- a minimum of 9 credits chosen from the following courses in lists A and B, with a minimum of six credits chosen from list A.
  - List A: **SC/BIOL 3010 3.00**, **SC/BIOL 3120 3.00**, **SC/BIOL 3155**

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(SC/BIOL) courses with an associated laboratory component.

### Biotechnology Stream

- **SC/CHEM 1000 3.00** and **SC/CHEM 1001 3.00**; **SC/PHYS 1410 6.00**;
- one of **SC/PHYS 1410 6.00**, **SC/PHYS 1420 6.00**, **SC/PHYS 1010 6.00**, **SC/ISCI 1310 6.00**, **SC/PHYS 1411 3.00** and **SC/PHYS 1412 3.00**, **SC/PHYS 1421 3.00** and **SC/PHYS 1422 3.00**, **SC/PHYS 1011 3.00** and **SC/PHYS 1012 3.00**, **SC/ISCI 1301 3.00** and **SC/ISCI 1302 3.00**.
- one of **AP/PHIL 2070 3.00** or **AP/PHIL 2075 3.00** (this course will count towards the non-science requirement in the General Education component);
- **SC/BIOL 1000 3.00** and **SC/BIOL 1001 3.00**, **SC/BIOL 2020 3.00**, **SC/BIOL 2021 3.00**, **SC/BIOL 2040 3.00**, **SC/BIOL 2060 3.00**, **SC/BIOL 2070 3.00** and both **SC/CHEM 2020 3.00** and **SC/CHEM 2021 3.00**;
- **SC/CHEM 2080 4.00**, **SC/CHEM 3070 3.00** or **SC/CHEM 3071 3.00**, **SC/CHEM 4050 3.00**, **SC/CHEM 3080 4.00**;
- **SC/BIOL 3100 2.00**, **SC/BIOL 3110 3.00**, **SC/BIOL 3130 3.00**, **SC/BIOL 3140 4.00**, **SC/BIOL 3150 4.00**;
- **SC/BIOL 4000 8.00** or **SC/BIOL 4000 3.00**, **SC/BIOL 4290 4.00**;
- a minimum of 9 credits chosen from the following courses in lists A and B, with a minimum of six credits chosen from list A.
  - List A: **SC/BIOL 3010 3.00**, **SC/BIOL 3120 3.00**, **SC/BIOL 3155**
<table>
<thead>
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<th>Credits</th>
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<td>SC/BIOL 4030</td>
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<tr>
<td>SC/BIOL 4061</td>
<td>3.00</td>
</tr>
<tr>
<td>SC/BIOL 4285</td>
<td>3.00</td>
</tr>
</tbody>
</table>

- List B: SC/BIOL 3160 4.00 (SC/BIOL 2010 4.00 is a prerequisite), SC/BIOL 4010 3.00, SC/BIOL 4040 3.00, SC/BIOL 4150 3.00, SC/BIOL 4151 3.00, SC/BIOL 4160 3.00, SC/BIOL 4270 3.00, SC/BIOL 4370 3.00, SC/BIOL 4510 3.00;

- additional biology 9SC/BIOL) credits as required for an overall total of at least 57 biology credits, including at least 12 credits at the 4000 level.

C. Science breadth: a total of 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 15 of these 24 credits are satisfied by the General Education requirement. In the biomedical science and biotechnology streams, this requirement is fully satisfied by the above requirements.

D. Upper level: a minimum of 42 credits at the 3000 level or above.

E. Additional elective credits, as required, for an overall total of 120 credits.

F. Standing requirements: to declare Specialized Honours requires successful completion of at least 24 credits, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed and a minimum cumulative credit-weighted grade point average of 6.00 (B) over all biology courses completed.
To proceed in each year of a Specialized Honours program requires a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed and a minimum cumulative credit-weighted grade point average of 6.00 (B) over all biology courses completed.

To graduate in a Specialized Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 6.00 (B) over all biology courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.

**Honours Major Program (BSc)**

In addition to the Biology Honours Major, students may follow a stream in biomedical science.

A. General education:

- non-science requirement: 12 credits;
- mathematics: SC/MATH 1506 3.00 and SC/MATH 1507 3.00, or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00;
- computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;
- foundational science: one of SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00); SC/PHYS 1410 6.00; SC/PHYS 1420 6.00; SC/PHYS 1010 6.00; SC/ISCI 1310 6.00; SC/PHYS 1411 3.00 and SC/PHYS 1412 3.00 and SC/PHYS 1412
3.00; SC/PHYS 1421 3.00 and SC/PHYS 1422 3.00; SC/PHYS 1011 3.00 and SC/PHYS 1012 3.00; SC/ISCI 1301 3.00 and SC/ISCI 1302 3.00. Note that the biomedical science stream requires specific courses (see below).

B. Major requirements:

**Biology stream**

- The program core, as specified above (24 credits);
- additional credits from biology (SC/BIOL) courses, as required, for an overall total of at least 51 credits from biology (SC/BIOL) courses, including at least 18 credits at the 3000 or higher level, of which at least 12 credits are at the 4000 level.

**Biomedical Science Stream**

- SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00;
- one of SC/PHYS 1410 6.00; SC/PHYS 1420 6.00; SC/PHYS 1010 6.00; SC/ISCI 1310 6.00; SC/PHYS 1411 3.00 and SC/PHYS 1412 3.00; SC/PHYS 1421 3.00 and SC/PHYS 1422 3.00; SC/PHYS 1011 3.00 and SC/PHYS 1012 3.00; SC/ISCI 1301 3.00 and SC/ISCI 1302 3.00; HH/PSYC 1010 6.00;
- SC/Biol 1000 3.00 and SC/Biol 1001 3.00, SC/Biol 2020 3.00, SC/Biol 2021 3.00, SC/Biol 2040 3.00, SC/Biol 2060 3.00; SC/Biol 2070 3.00; Note

3.00; SC/PHYS 1421 3.00 and SC/PHYS 1422 3.00; SC/PHYS 1011 3.00 and SC/PHYS 1012 3.00; SC/ISCI 1301 3.00 and SC/ISCI 1302 3.00. Note that the biomedical science stream requires specific courses (see below).

B. Major requirements:

**Biology stream**

- The program core, as specified above (24 credits);
- additional credits from biology (SC/BIOL) courses, as required, for an overall total of at least 51 credits from biology (SC/BIOL) courses, including at least 18 credits at the 3000 or higher level, of which at least 12 credits are at the 4000 level.

**Biomedical Science Stream**

- SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00;
- one of SC/PHYS 1410 6.00; SC/PHYS 1420 6.00; SC/PHYS 1010 6.00; SC/ISCI 1310 6.00; SC/PHYS 1411 3.00 and SC/PHYS 1412 3.00; SC/PHYS 1421 3.00 and SC/PHYS 1422 3.00; SC/PHYS 1011 3.00 and SC/PHYS 1012 3.00; SC/ISCI 1301 3.00 and SC/ISCI 1302 3.00; HH/PSYC 1010 6.00;
- SC/Biol 1000 3.00 and SC/Biol 1001 3.00, SC/Biol 2020 3.00, SC/Biol 2021 3.00, SC/Biol 2040 3.00, SC/Biol 2060 3.00; SC/Biol 2070 3.00; Note
students intending to take physiology courses must also complete **SC/BIOL 2030 4.00**;
- **SC/CHEM 2020 3.00** and **SC/CHEM 2021 3.00**;
- a minimum of nine credits chosen from the following courses: **SC/BIOL 3060 4.00**; **SC/BIOL 3070 4.00**; **SC/BIOL 3110 3.00**; **SC/BIOL 3130 3.00**; **SC/BIOL 3150 4.00**; **SC/BIOL 3155 3.00**; **SC/BIOL 4010 3.00**;
- additional biology (SC/BIOL) credits from the following courses, as required, for an overall total of 51 biology (SC/BIOL) credits: **SC/BIOL 2010 4.00**, **SC/BIOL 2030 4.00**, **SC/BIOL 3010 3.00**, **SC/BIOL 3060 4.00**, **SC/BIOL 3070 4.00**, **SC/BIOL 3071 3.00**, **SC/BIOL 3110 3.00**, **SC/BIOL 3120 3.00**, **SC/BIOL 3130 3.00**, **SC/BIOL 3140 4.00**, **SC/BIOL 3150 4.00**, **SC/BIOL 3155 3.00**, **SC/BIOL 3350 4.00**, **SC/BIOL 4000 3.00**, **SC/BIOL 4000 8.00**, **SC/BIOL 4005 3.00**, **SC/BIOL 4010 3.00**, **SC/BIOL 4020 3.00**, **SC/BIOL 4030 3.00**, **SC/BIOL 4040 3.00**, **SC/BIOL 4061 3.00**, **SC/BIOL 4120 3.00**, **SC/BIOL 4141 3.00**, **SC/BIOL 4150 3.00**, **SC/BIOL 4151 3.00**, **SC/BIOL 4155 3.00**, **SC/BIOL 4160 3.00**, **SC/BIOL 4200 3.00**, **SC/BIOL 4220 4.00**, **SC/BIOL 4270 3.00**, **SC/BIOL 4285 3.00**, **SC/BIOL 4290 4.00**, **SC/BIOL 4310 3.00**, **SC/BIOL 4320 3.00**, **SC/BIOL 4350 4.00**, **SC/BIOL 4360 3.00**, **SC/BIOL 4380 3.00**, **SC/BIOL 4410 3.00**, **SC/BIOL 4450 4.00**, **SC/BIOL 4510 3.00**;
- within the 51 biology (SC/BIOL) credits at least 18 credits must be at the 3000 level or higher, of which

students intending to take physiology courses must also complete **SC/BIOL 2030 4.00**;
- **SC/CHEM 2020 3.00** and **SC/CHEM 2021 3.00**;
- a minimum of nine credits chosen from the following courses: **SC/BIOL 3060 4.00**; **SC/BIOL 3070 4.00**; **SC/BIOL 3110 3.00**; **SC/BIOL 3130 3.00**; **SC/BIOL 3150 4.00**; **SC/BIOL 3155 3.00**; **SC/BIOL 4010 3.00**;
- additional biology (SC/BIOL) credits from the following courses, as required, for an overall total of 51 biology (SC/BIOL) credits: **SC/BIOL 2010 4.00**, **SC/BIOL 2030 4.00**, **SC/BIOL 3010 3.00**, **SC/BIOL 3060 4.00**, **SC/BIOL 3070 4.00**, **SC/BIOL 3071 3.00**, **SC/BIOL 3110 3.00**, **SC/BIOL 3120 3.00**, **SC/BIOL 3130 3.00**, **SC/BIOL 3140 4.00**, **SC/BIOL 3150 4.00**, **SC/BIOL 3155 3.00**, **SC/BIOL 3350 4.00**, **SC/BIOL 4000 3.00**, **SC/BIOL 4000 8.00**, **SC/BIOL 4005 3.0**, **SC/BIOL 4010 3.00**, **SC/BIOL 4020 3.00**, **SC/BIOL 4030 3.00**, **SC/BIOL 4040 3.00**, **SC/BIOL 4061 3.00**, **SC/BIOL 4120 3.00**, **SC/BIOL 4141 3.00**, **SC/BIOL 4150 3.00**, **SC/BIOL 4151 3.00**, **SC/BIOL 4155 3.00**, **SC/BIOL 4160 3.00**, **SC/BIOL 4200 3.00**, **SC/BIOL 4220 4.00**, **SC/BIOL 4270 3.00**, **SC/BIOL 4285 3.00**, **SC/BIOL 4290 4.00**, **SC/BIOL 4310 3.00**, **SC/BIOL 4320 3.00**, **SC/BIOL 4350 4.00**, **SC/BIOL 4360 3.00**, **SC/BIOL 4380 3.00**, **SC/BIOL 4410 3.00**, **SC/BIOL 4450 4.00**, **SC/BIOL 4510 3.00**;
- within the 51 biology (SC/BIOL) credits at least 18 credits must be at the 3000 level or higher, of which
| at least 12 credits must be at the 4000 level. This must also include a minimum of seven credits from 3000 level or higher biology (SC/BIOL) courses with an associated laboratory component. |
| at least 12 credits must be at the 4000 level. This must also include a minimum of seven credits from 3000 level or higher biology (SC/BIOL) courses with an associated laboratory component. |

C. Science breadth: a total of 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 15 of these 24 credits are satisfied by the General Education requirement. In the biomedical science stream this requirement is fully satisfied by the above requirements.

D. Upper level: 42 credits at the 3000 level or above.

E. Additional elective credits, as required, for an overall minimum total of 85 credits from science disciplines (including the major) and an overall total of 120 credits.

F. Standing requirements: to graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all biology courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.

**Honours Double Major Program**

All Honours BSc degree candidates should consult departmental advisers as early as possible concerning course requirements for particular Honours Double Major programs. Possible subject combinations for Honours Double Major BSc degree programs are listed under Undergraduate Degree Programs in the Faculty of Science Undergraduate Degree and Certificate Programs section. Students should consult
with a departmental advisor to plan their studies in order to meet the requirements for both majors and their prerequisites.

A. General education:

- non-science requirement: 12 credits;
- mathematics: \textsc{sc/math} 1506 3.00 and \textsc{sc/math} 1507 3.00, or six credits from \textsc{sc/math} 1013 3.00, \textsc{sc/math} 1014 3.00, \textsc{sc/math} 1025 3.00;
- computer science: \textsc{le/eeecs} 1520 3.00 or \textsc{le/eeecs} 1530 3.00 or \textsc{le/eeecs} 1540 3.00;
- foundational science: one of \textsc{sc/chem} 1000 3.00 and \textsc{sc/chem} 1001 3.00 (prerequisites for \textsc{sc/biol} 2020 3.00 and \textsc{sc/chem} 2020 3.00); \textsc{sc/phys} 1410 6.00; \textsc{sc/phys} 1420 6.00; \textsc{sc/phys} 1010 6.00; \textsc{sc/isci} 1310 6.00; \textsc{sc/phys} 1411 3.00 and \textsc{sc/phys} 1412 3.00; \textsc{sc/phys} 1421 3.00 and \textsc{sc/phys} 1422 3.00; \textsc{sc/phys} 1011 3.00 and \textsc{sc/phys} 1012 3.00; \textsc{sc/isci} 1301 3.00 and \textsc{sc/isci} 1302 3.00.

B. Major requirements:

- \textsc{sc/biol} 1000 3.00 and \textsc{sc/biol} 1001 3.00;
- at least 12 credits from 2000-level biology courses in the program core;
- additional credits from biology (\textsc{sc/biol}) courses, as required for an overall total of at least 42 credits from biology (\textsc{sc/biol}) courses, including at least 18 credits at the 3000 level or above, of which at
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| least 12 credits are at the 4000 level;  
  • the course requirements for the second major. | least 12 credits are at the 4000 level;  
  • the course requirements for the second major. |
|  |  |
| C. Science breadth: a total of 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 15 of these 24 credits are satisfied by the General Education requirement. Satisfied if the other major is another science discipline. | C. Science breadth: a total of 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 15 of these 24 credits are satisfied by the General Education requirement. Satisfied if the other major is another science discipline. |
| D. Upper level: 42 credits at the 3000 level or above. | D. Upper level: 42 credits at the 3000 level or above. |
| E. Additional elective credits, as required for an overall total of 120 credits. | E. Additional elective credits, as required for an overall total of 120 credits. |
| F. Standing requirements: to graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all biology courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed. | F. Standing requirements: to graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all biology courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed. |

### Honours Major/Minor Program

An Honours Major in biology may be combined with an Honours Minor in another subject area in an Honours Major/Minor BSc degree program. Possible subject combinations are listed under Undergraduate Degree Programs in the Faculty of Science Undergraduate Degree and Certificate Programs section.

Students may follow a stream within the Honours Major/Minor program in Biomedical Science (stream requirements are listed under the Biology Honours Major Program section).
This stream may be combined with other approved science minors.

A. General education:

- non-science requirement: 12 credits;
- mathematics: \textit{SC/MATH 1506 3.00} and \textit{SC/MATH 1507 3.00}, or six credits from \textit{SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00};
- computer science: \textit{LE/EECS 1520 3.00} or \textit{LE/EECS 1530 3.00} or \textit{LE/EECS 1540 3.00};
- foundational science: one of \textit{SC/CHEM 1000 3.00} and \textit{SC/CHEM 1001 3.00} (prerequisites for \textit{SC/BIOL 2020 3.00} and \textit{SC/CHEM 2020 3.00}); \textit{SC/PHYS 1410 6.00; SC/PHYS 1420 6.00; SC/PHYS 1010 6.00; SC/ISCI 1310 6.00; SC/PHYS 1411 3.00 and SC/PHYS 1412 3.00; SC/PHYS 1421 3.00 and SC/PHYS 1422 3.00; SC/PHYS 1011 3.00 and SC/PHYS 1012 3.00; SC/ISCI 1301 3.00 and SC/ISCI 1302 3.00}.

B. Major requirements:

**Biology stream**

- the program core as specified above (24 credits);
- additional credits from biology courses, as required, for an overall total of at least 51 credits from biology courses, including at least 18 credits at the 3000 or higher level, of which at least 12 credits are at the 4000 level.

B. Major requirements:

**Biology stream**

- the program core as specified above (24 credits);
- additional credits from biology courses, as required, for an overall total of at least 51 credits from biology courses, including at least 18 credits at the 3000 or higher level, of which at least 12 credits are at the 4000 level.
The course requirements for the minor.

**Biomedical Science Stream**

- **SC/CHEM 1000 3.00** and **SC/CHEM 1001 3.00**;
- one of **SC/PHYS 1410 6.00**, **SC/PHYS 1420 6.00**, **SC/PHYS 1010 6.00**, **SC/ISCI 1310 6.00**, **SC/PHYS 1411 3.00**, **SC/PHYS 1412 3.00**, **SC/PHYS 1421 3.00**, **SC/PHYS 1422 3.00**, **SC/PHYS 1011 3.00**, **SC/PHYS 1012 3.00**, **SC/ISCI 1301 3.00**, **SC/ISCI 1302 3.00**, **HH/PSYC 1010 6.00**;
- **SC/Biol 1000 3.00** and **SC/Biol 1001 3.00**, **SC/Biol 2020 3.00**, **SC/Biol 2021 3.00**, **SC/Biol 2040 3.00**, **SC/Biol 2060 3.00**, **SC/Biol 2070 3.00**; Note students intending to take physiology courses must also complete **SC/Biol 2030 4.00**;
- **SC/CHEM 2020 3.00** and **SC/CHEM 2021 3.00**;
- a minimum of nine credits chosen from the following courses: **SC/Biol 3060 4.00**, **SC/Biol 3070 4.00**, **SC/Biol 3100 2.00**, **SC/Biol 3110 3.00**, **SC/Biol 3130 3.00**, **SC/Biol 3150 4.00**, **SC/Biol 3155 3.00**, **SC/Biol 4010 3.00**;
- additional biology credits from the following courses, as required, for an overall total of 51 biology (SC/Biol) credits: **SC/Biol 2010 4.00**, **SC/Biol 2030 4.00**, **SC/Biol 3010 3.00**, **SC/Biol 3060 4.00**, **SC/Biol 3070 4.00**, **SC/Biol 3071 3.00**, **SC/Biol 3110 3.00**, **SC/Biol 3120 3.00**;

**Biomedical Science Stream**

- **SC/CHEM 1000 3.00** and **SC/CHEM 1001 3.00**;
- one of **SC/PHYS 1410 6.00**, **SC/PHYS 1420 6.00**, **SC/PHYS 1010 6.00**, **SC/ISCI 1310 6.00**, **SC/PHYS 1411 3.00**, **SC/PHYS 1412 3.00**, **SC/PHYS 1421 3.00**, **SC/PHYS 1422 3.00**, **SC/PHYS 1011 3.00**, **SC/PHYS 1012 3.00**, **SC/ISCI 1301 3.00**, **SC/ISCI 1302 3.00**, **HH/PSYC 1010 6.00**;
- **SC/Biol 1000 3.00** and **SC/Biol 1001 3.00**, **SC/Biol 2020 3.00**, **SC/Biol 2021 3.00**, **SC/Biol 2040 3.00**, **SC/Biol 2060 3.00**, **SC/Biol 2070 3.00**; Note students intending to take physiology courses must also complete **SC/Biol 2030 4.00**;
- **SC/CHEM 2020 3.00** and **SC/CHEM 2021 3.00**;
- a minimum of nine credits chosen from the following courses: **SC/Biol 3060 4.00**, **SC/Biol 3070 4.00**, **SC/Biol 3100 2.00**, **SC/Biol 3110 3.00**, **SC/Biol 3130 3.00**, **SC/Biol 3150 4.00**, **SC/Biol 3155 3.00**, **SC/Biol 4010 3.00**;
- additional biology credits from the following courses, as required, for an overall total of 51 biology (SC/Biol) credits: **SC/Biol 2010 4.00**, **SC/Biol 2030 4.00**, **SC/Biol 3010 3.00**, **SC/Biol 3060 4.00**, **SC/Biol 3070 4.00**, **SC/Biol 3071 3.00**, **SC/Biol 3110 3.00**, **SC/Biol 3120 3.00**, **SC/Biol 3120 3.00**;
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- within the 51 biology (SC/BIOL) credits at least 18 credits must be at the 3000 level or higher, of which at least 12 credits must be at the 4000 level. This must also include a minimum of seven credits from 3000 level or higher biology (SC/BIOL) courses with an associated laboratory component.

C. Science breadth: a total of 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 15 of these 24 credits are satisfied by the General Education requirement. Satisfied if the minor is another science discipline.

D. Upper level: 42 credits at the 3000 level or above.

E. Additional elective credits, as required for an overall total of 120 credits.
F. Standing requirements: to graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all biology courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.

Honours Minor

- SC/Biol 1000 3.00 and SC/Biol 1001 3.00;
- at least 12 credits from biology (SC/Biol) courses at the 2000 level;
- at least nine credits from biology (SC/Biol) courses at the 3000 or higher level, including at least three credits at the 4000 level;
- additional credits from biology (SC/Biol) courses at the 2000 or higher level, as required for an overall total of at least 30 credits from biology (SC/Biol) courses.

Note: it is recommended that students interested in cell biology, genetics, molecular biology and biochemistry take the following courses: SC/Biol 1000 3.00 and SC/Biol 1001 3.00, SC/CHEM 1000 3.00, SC/CHEM 1001 3.00, SC/Biol 2020 3.00, SC/Biol 2021 3.00, SC/Biol 2040 3.00, SC/Biol 2070 3.00, SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00, plus a minimum of nine additional credits from biology (SC/Biol) courses at the 3000 or higher level. For other areas of interest, additional elective credits, as required for an overall total of 120 credits.

E. Additional elective credits, as required for an overall total of 120 credits.

F. Standing requirements: to graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all biology courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.

Honours Minor

- SC/Biol 1000 3.00 and SC/Biol 1001 3.00;
- at least 12 credits from biology (SC/Biol) courses at the 2000 level;
- at least nine credits from biology (SC/Biol) courses at the 3000 or higher level, including at least three credits at the 4000 level;
- additional credits from biology (SC/Biol) courses at the 2000 or higher level, as required for an overall total of at least 30 credits from biology (SC/Biol) courses.

Note: it is recommended that students interested in cell biology, genetics, molecular biology and biochemistry take the following courses: SC/Biol 1000 3.00 and SC/Biol 1001 3.00, SC/CHEM 1000 3.00, SC/CHEM 1001 3.00, SC/Biol 2020 3.00, SC/Biol 2021 3.00, SC/Biol 2040 3.00, SC/Biol 2070 3.00, SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00, plus a
students are advised to choose their 2000-level biology (SC/BIOL) courses wisely, based on the prerequisites for the courses they wish to take at the 3000 or higher level. Check the course outlines in this publication for course prerequisites.

International Bachelor of Science

All Honours iBSc degree candidates must complete an international component in addition to the normal requirements of biology and the BSc. For further information about the international Bachelor of Science, refer to the International Bachelor of Arts and International Bachelor of Science in the Faculty of Science programs of study section.

Specialized Honours in Biology (Specialized Honours iBSc)

A. General education:

- non-science requirement: 12 credits (may be satisfied in whole or part by courses in the international component);
- mathematics: SC/MATH 1506 3.00 and SC/MATH 1507 3.00, or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00;
- computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;
- foundational science: one of SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00); SC/PHYS 1410 6.00; SC/PHYS 1420 6.00; SC/PHYS 1010 6.00; SC/ISCI 1310

For other areas of interest, students are advised to choose their 2000-level biology (SC/BIOL) courses wisely, based on the prerequisites for the courses they wish to take at the 3000 or higher level. Check the course outlines in this publication for course prerequisites.

International Bachelor of Science

All Honours iBSc degree candidates must complete an international component in addition to the normal requirements of biology and the BSc. For further information about the international Bachelor of Science, refer to the International Bachelor of Arts and International Bachelor of Science in the Faculty of Science programs of study section.

Specialized Honours in Biology (Specialized Honours iBSc)

A. General education:

- non-science requirement: 12 credits (may be satisfied in whole or part by courses in the international component);
- mathematics: SC/MATH 1506 3.00 and SC/MATH 1507 3.00, or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00;
- computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;
- foundational science: one of SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00);
B. Major requirements:

- the program core as specified above (24 credits);
- *SC/Biol 4000 8.00* or *SC/Biol 4000 3.00*;
- additional credits from biology (SC/Biol) courses, as required for an overall total of at least 62 credits from biology (SC/Biol) courses, including at least 18 credits at the 3000 or higher level, of which at least 12 credits are at the 4000 level.

In addition, the following must be completed for the international component:

- a minimum of 12 credits of language study in one of the languages offered at York University;
- a minimum of 12 credits of non-science courses with an international component (refer to sample list of courses in the section on international degrees), which will also serve to meet the non-science requirement of the general education component;
- an additional six credits of language study or non-science international component courses, for a total of 30 credits;
- one to two exchange terms abroad as a full-time student at an institution with which York
University has a formal exchange agreement.

C. Science breadth: 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 15 of these 24 credits are satisfied by the above requirements.

D. Upper level: a minimum of 42 credits at the 3000 level or above.

E. Additional elective credits, as required, for an overall total of 120 credits.

F. Standing requirement: to declare Specialized Honours requires successful completion of at least 24 credits, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed and a minimum cumulative credit-weighted grade point average of 6.00 (B) over all biology (SC/BIOL) courses completed.

To proceed in each year of a Specialized Honours program requires a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed and a minimum cumulative credit-weighted grade point average of 6.00 (B) over all biology (SC/BIOL) courses completed.

To graduate in a Specialized Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 6.00 (B) over all biology (SC/BIOL) courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.

- one to two exchange terms abroad as a full-time student at an institution with which York University has a formal exchange agreement.

C. Science breadth: 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 15 of these 24 credits are satisfied by the above requirements.

D. Upper level: a minimum of 42 credits at the 3000 level or above.

E. Additional elective credits, as required, for an overall total of 120 credits.

F. Standing requirement: to declare Specialized Honours requires successful completion of at least 24 credits, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed and a minimum cumulative credit-weighted grade point average of 6.00 (B) over all biology (SC/BIOL) courses completed.

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To graduate in a Specialized Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 6.00 (B) over all biology (SC/BIOL) courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.
**Honours Major Program (iBSc)**

Students may follow a stream within the Honours Major program in biomedical science.

### A. General education:

- **non-science requirement:** 12 credits (may be satisfied in whole or part by courses in the international component).
- **mathematics:** \( SC/MATH 1506 \ 3.00 \) and \( SC/MATH 1507 \ 3.00 \), or six credits from \( SC/MATH 1013 \ 3.00 \), \( SC/MATH 1014 \ 3.00 \), \( SC/MATH 1025 \ 3.00 \);
- **computer science:** \( LE/EECS 1520 \ 3.00 \) or \( LE/EECS 1530 \ 3.00 \) or \( LE/EECS 1540 \ 3.00 \);
- **foundational science:** one of \( SC/CHEM 1000 \ 3.00 \) and \( SC/CHEM 1001 \ 3.00 \) (prerequisites for \( SC/BIOL \ 2020 \ 3.00 \) and \( SC/CHEM 2020 \ 3.00 \)); \( SC/PHYS 1410 \ 6.00 \); \( SC/PHYS 1420 \ 6.00 \); \( SC/PHYS 1010 \ 6.00 \); \( SC/ISCI 1310 \ 6.00 \); \( SC/PHYS 1411 \ 3.00 \) and \( SC/PHYS 1412 \ 3.00 \); \( SC/PHYS 1421 \ 3.00 \) and \( SC/PHYS 1422 \ 3.00 \); \( SC/PHYS 1011 \ 3.00 \) and \( SC/PHYS 1012 \ 3.00 \); \( SC/ISCI 1301 \ 3.00 \) and \( SC/ISCI 1302 \ 3.00 \).

### B. Major requirements:

**Biology stream**

- the program core as specified above (24 credits);
- additional credits from biology (SC/BIOL) courses, as required, for an overall total of at least 45 credits from biology (SC/BIOL) courses;
including at least 18 credits at the 3000 or higher level, of which at least 12 credits are at the 4000 level;

**Biomedical Science Stream (iBSc)**

- SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00;
- one of SC/PHYS 1410 6.00; SC/PHYS 1420 6.00; SC/PHYS 1010 6.00; SC/ISCI 1310 6.00; SC/PHYS 1411 3.00; SC/PHYS 1412 3.00; SC/PHYS 1421 3.00; SC/PHYS 1422 3.00; SC/PHYS 1011 3.00; SC/PHYS 1012 3.00; SC/ISCI 1301 3.00; SC/ISCI 1302 3.00; HH/PSYC 1010 6.00;
- SC/BIOL 1000 3.00; SC/BIOL 1001 3.00, SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2040 3.00, SC/BIOL 2060 3.00, SC/BIOL 2070 3.00; Note students intending to take physiology courses must also complete SC/BIOL 2030 4.00;
- SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00;
- a minimum of nine credits chosen from the following courses: SC/BIOL 3060 4.00; SC/BIOL 3070 4.00; SC/BIOL 3110 3.00; SC/BIOL 3130 3.00; SC/BIOL 3150 4.00; SC/BIOL 3155 3.00; SC/BIOL 4010 3.00;
- additional biology (SC/BIOL) credits from the following courses, as required, for an overall total of 42 biology (SC/BIOL) credits: SC/BIOL 2010 4.00, SC/BIOL 2030 4.00, SC/BIOL 3010 3.00, SC/BIOL 3060 4.00, SC/BIOL 3070 4.00; SC/BIOL 3080 4.00, SC/BIOL 3070

including at least 18 credits at the 3000 or higher level, of which at least 12 credits are at the 4000 level;

**Biomedical Science Stream (iBSc)**

- SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00;
- one of SC/PHYS 1410 6.00; SC/PHYS 1420 6.00; SC/PHYS 1010 6.00; SC/ISCI 1310 6.00; SC/PHYS 1411 3.00; SC/PHYS 1412 3.00; SC/PHYS 1421 3.00; SC/PHYS 1422 3.00; SC/PHYS 1011 3.00; SC/PHYS 1012 3.00; SC/ISCI 1301 3.00; SC/ISCI 1302 3.00; HH/PSYC 1010 6.00;
- SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00, SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2040 3.00, SC/BIOL 2060 3.00, SC/BIOL 2070 3.00; Note students intending to take physiology courses must also complete SC/BIOL 2030 4.00;
- SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00;
- a minimum of nine credits chosen from the following courses: SC/BIOL 3060 4.00; SC/BIOL 3070 4.00; SC/BIOL 3110 3.00; SC/BIOL 3130 3.00; SC/BIOL 3150 4.00; SC/BIOL 3155 3.00; SC/BIOL 4010 3.00;
- additional biology (SC/BIOL) credits from the following courses, as required, for an overall total of 42 biology (SC/BIOL) credits: SC/BIOL 2010 4.00, SC/BIOL 2030 4.00, SC/BIOL 3010 3.00, SC/BIOL 3060 4.00, SC/BIOL 3070 4.00; SC/BIOL 3080 4.00, SC/BIOL 3070
4.00, SC/BIOL 3071 3.00, SC/BIOL 3110 3.00, SC/BIOL 3120 3.00, SC/BIOL 3130 3.00, SC/BIOL 3140 4.00, SC/BIOL 3150 4.00, SC/BIOL 3155 3.00, SC/BIOL 3350 4.00, SC/BIOL 4000 3.00, SC/BIOL 4000 8.00, SC/BIOL 4010 3.00, SC/BIOL 4020 3.00, SC/BIOL 4030 3.00, SC/BIOL 4040 3.00, SC/BIOL 4061 3.00, SC/BIOL 4120 3.00, SC/BIOL 4141 3.00, SC/BIOL 4150 3.00, SC/BIOL 4151 3.00, SC/BIOL 4155 3.00, SC/BIOL 4160 3.00, SC/BIOL 4200 3.00, SC/BIOL 4220 4.00, SC/BIOL 4270 3.00, SC/BIOL 4285 3.00, SC/BIOL 4290 4.00, SC/BIOL 4310 3.00, SC/BIOL 4320 3.00, SC/BIOL 4350 4.00, SC/BIOL 4360 3.00, SC/BIOL 4380 3.00, SC/BIOL 4410 3.00, SC/BIOL 4450 4.00, SC/BIOL 4510 3.00;

- within the 42 biology (SC/BIOL) credits at least 18 credits must be at the 3000 level or higher, of which at least 12 credits must be at the 4000 level. This must also include a minimum of seven credits from 3000 level or higher biology (SC/BIOL) courses with an associated laboratory component.

In addition, the following must be completed for the international component:

- a minimum of 12 credits of language study in one of the languages offered at York University;
- a minimum of 12 credits of non-science courses with an international component (refer to sample list of courses in the section

4.00, SC/BIOL 3071 3.00, SC/BIOL 3110 3.00, SC/BIOL 3120 3.00, SC/BIOL 3130 3.00, SC/BIOL 3140 4.00, SC/BIOL 3150 4.00, SC/BIOL 3155 3.00, SC/BIOL 3350 4.00, SC/BIOL 4000 3.00, SC/BIOL 4000 8.00, SC/BIOL 4005 3.0, SC/BIOL 4010 3.00, SC/BIOL 4020 3.00, SC/BIOL 4030 3.00, SC/BIOL 4040 3.00, SC/BIOL 4061 3.00, SC/BIOL 4120 3.00, SC/BIOL 4141 3.00, SC/BIOL 4150 3.00, SC/BIOL 4151 3.00, SC/BIOL 4155 3.00, SC/BIOL 4160 3.00, SC/BIOL 4200 3.00, SC/BIOL 4220 4.00, SC/BIOL 4270 3.00, SC/BIOL 4285 3.00, SC/BIOL 4290 4.00, SC/BIOL 4310 3.00, SC/BIOL 4320 3.00, SC/BIOL 4350 4.00, SC/BIOL 4360 3.00, SC/BIOL 4370 3.00, SC/BIOL 4380 3.00, SC/BIOL 4410 3.00, SC/BIOL 4450 4.00, SC/BIOL 4510 3.00;

- within the 42 biology (SC/BIOL) credits at least 18 credits must be at the 3000 level or higher, of which at least 12 credits must be at the 4000 level. This must also include a minimum of seven credits from 3000 level or higher biology (SC/BIOL) courses with an associated laboratory component.

In addition, the following must be completed for the international component:

- a minimum of 12 credits of language study in one of the languages offered at York University;
- a minimum of 12 credits of non-science courses with an international component (refer to sample list of courses in the section
on international degrees), which will also serve to meet the non-science requirement of the general education component;
- an additional six credits of language study or non-science international component courses, for a total of 30 credits;
- one to two exchange terms abroad as a full-time student at an institution with which York University has a formal exchange agreement.

C. Science breadth: 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 15 of these 24 credits are satisfied by the above requirements.

D. Upper level: a minimum of 42 credits at the 3000 level or above.

E. Additional elective credits, as required, for an overall total of 85 credits from science disciplines (including the major) and an overall total of 120 credits.

F. Standing requirements: to graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all biology (SC/BIOL) courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.

Honours Major/Minor Program (iBSc)

Students may follow a stream within the Honours Major/Minor program in biomedical science (stream requirements are listed under the Biology Honours Major Program (iBSc)).
program). This stream may be combined with other approved science minors.

### A. General Education:

- **non-science requirement:** 12 credits (may be satisfied in whole or part by courses in the international component);
- **mathematics:** SC/MATH 1506 3.00 and SC/MATH 1507 3.00, or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00;
- **computer science:** LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;
- **foundational science:** one of SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00); SC/PHYS 1410 6.00; SC/PHYS 1420 6.00; SC/PHYS 1010 6.00; SC/ISCI 1310 6.00; SC/PHYS 1411 3.00 and SC/PHYS 1412 3.00; SC/PHYS 1421 3.00 and SC/PHYS 1422 3.00; SC/PHYS 1011 3.00 and SC/PHYS 1012 3.00; SC/ISCI 1301 3.00 and SC/ISCI 1302 3.00.

### B. Major requirements:

#### Biology stream

- the program core as specified above (24 credits);
- additional credits from biology (SC/BIOL) courses, as required, for an overall total of at least 45 credits from biology (SC/BIOL) courses, including at least 18 credits at the 3000 or higher level, of which at
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- within the 42 biology (SC/Biol) credits at least 18 credits must be at the 3000 level or higher, of which at least 12 credits must be at the 4000 level. This must also include a minimum of seven credits from 3000 level or higher biology (SC/Biol) courses with an associated laboratory component;
- the course requirements for the minor.

In addition, the following must be completed for the international component:

- a minimum of 12 credits of language study in one of the languages offered at York University;
- a minimum of 12 credits of non-science courses with an international component (refer to
sample list of courses in the section on international degrees), which will also serve to meet the non-science requirement of the general education component:

- an additional six credits of language study or non-science international component courses, for a total of 30 credits;
- one to two exchange terms abroad as a full-time student at an institution with which York University has a formal exchange agreement.

C. Science breadth: a total of 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. On the biology stream, 15 of these 24 credits are satisfied by the General Education requirement. In the biomedical science stream this requirement is fully satisfied by the above requirements. Satisfied if the minor is another science discipline.

D. Upper level: 42 credits at the 3000 level or above.

E. Additional elective credits, as required, for an overall total of 120 credits.

F. Standing requirements: to graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all biology (SC/BIOL) courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.
Non-Major Modification Program Changes

1. Programs:
   Chemistry

2. Degree Designation:
   BSc Chemistry

3. Type of Modification: minor change to wording of major requirements to clarify language

4. Effective Date: FW23

5. State what the changes are

   The wording of one of the major requirements for the 90-credit Bachelor program is potentially ambiguous. The specific wording concerns the requirement: “At least 15 credits from chemistry courses at the 3000 or higher level…” which is not meant to include CHEM 3000 and CHEM 3001 since they are part of the program core. However, there is the potential for student confusion since a possible interpretation of the language is that CHEM 3000 and 3001 are included in the 15-credit count, which they are not. The revised wording to clarify this requirement would become “At least 15 additional credits from chemistry courses at the 3000 or higher level…”. This change would result in the same language as a similar requirement in the Specialized Honours Program.

6. Provide an updated mapping of the program requirements to the program learning outcomes to illustrate how the proposed requirements will support the achievement of program learning objectives.

   No change in mapping

7. If relevant, summarize the consultation undertaken with relevant academic units, including commentary on the impact of the proposed changes on other programs. Provide individual statements from the relevant program(s) confirming consultation and their support.

   No impact on other programs is intended nor anticipated.

8. Describe any resource implications and how they are being addressed (e.g., through a reallocation of existing resources). If new/additional resources are required, provide a statement from the relevant Dean(s)/Principal confirming resources will be in place to implement the changes.

   none

9. Provide a summary of how students currently enrolled in the program will be accommodated.

   The degree requirements for the 90-credit Bachelor’s program have not been affected by this change, so no impact on current students is expected.
10. Provide as an appendix a side-by-side comparison of the existing and proposed program requirements as they will appear in the Undergraduate or Graduate Calendar.

(see next page)
Chemistry

Change from

Program Core
[…]

Bachelor Program
[…]
B. Major requirements:

• […];
  • at least 15 credits from chemistry courses at the 3000 or higher level, excluding SC/CHEM 4100 6.00 (Note: SC/CHEM 3080 4.00 is strongly advised.).
• […]

Change to

Program Core
[…]

Bachelor Program
[…]
B. Major requirements:

• […]
  • at least **additional** 15 credits from chemistry courses at the 3000 or higher level, excluding SC/CHEM 4100 6.00 (Note: SC/CHEM 3080 4.00 is strongly advised.).
• […]

[…]

1. **Program:** Mathematics and Statistics

2. **Course Number:** MATH 4940

3. **Credit Value:** 3.0

4. **Long Course Title:** Perturbation Methods

5. **Short Course Title:** Perturbation Methods
   
   *This is the title that will appear on University documents where space is limited, such as transcripts and lecture schedules. The short course title may be a maximum 40 characters, including punctuation and spaces.*

6. **Effective Session:** FW2023

7. **Calendar (Short) Course Description:** This course introduces perturbative methods as techniques for finding approximate solutions to mathematical problems. The course begins with approximating roots to polynomials before exploring applications in linear algebra, integrals, and differential equations.

8. **Expanded Course Description:** This course introduces students to the concept of formal perturbation expansions as a means of approximation. Beginning with polynomial roots students will learn the concept of regular and singular expansions and discuss the concepts of order and term balancing. Students will explore perturbative solutions in linear algebra to decouple nearly degenerate eigenvalues. They will explore a variety of techniques for asymptotically approximating integrals including Laplace’s Method, the method of steepest descent, and successive integration by parts. The concept of matched asymptotic expansions will be introduced through solving ordinary differential equations with boundary layers. Differential equations will also be used to introduce the concept of multiple timescales.

   Prerequisites: SC/MATH 1021 or SC/MATH 1025; SC/MATH 1310 or SC/MATH 1014; SC/MATH 2270 or SC/MATH 2271.
9. Course Learning Outcomes:
   CLO 1 – Students will understand big O and little o notation and be able to rank terms in various mathematical expressions by size.
   CLO 2 – Students will be able to define and differentiate the terms regular and singular perturbation expansion.
   CLO 3 – Students will learn the difference between convergent, divergent, and asymptotic series. They will learn when, why, and how asymptotic series solutions are valid.
   CLO 4 – Students will be able to find both regular and singular perturbative roots to polynomials of any order. They will learn how to balance terms for asymptotic consistency.
   CLO 5 – Students will learn about the Fredholm alternative in linear algebra and use it find perturbative expansions of eigenvalues.
   CLO 6 – Students will learn and identify dominant regions of integration. They will learn how to isolate different dominant regions and evaluate the resulting integrals
   CLO 7 – Students will learn about boundary layers in differential equations. They will discover their application to various fields and the relevance of them to the mathematical structure of a problem.
   CLO 8 – Students will develop the method of matched asymptotic expansions for differential equations. They will formulate outer solutions, inner solutions, and composite solutions understanding the domain of validity for each.

10. Rationale: This course will expand upon the techniques that undergraduate students in mathematics learn for solving problems. Perturbation methods leads students towards the concept of model reduction which can be used to better understand mechanistic processes that models are describing. Reduced models can simplify and speed up computations. They can also help uncover unidentifiable terms and parameters which can assist with data analysis and fitting. There is no direct overlap with any undergraduate or graduate courses currently on offer, but students will have some exposure to these ideas in MATH 4090, MATH 4120, and MATH 4271. While asymptotic methods may be used as needed in those courses, this course will provide students with a deeper rationale for why the methods work and when they are useful. This knowledge will compliment other technique and application courses in the program.

11. Evaluation:
Undergraduate:
   Students will typically complete a series of homework assignments and a final exam.
   Homework 3*20%=60%
   Exam 40%
Graduate:
   Students will typically complete a series of homework assignments, a project, and a final exam.
   Homework 3*16%=48%
   Project 20%
   Exam 32%

The course project will typically expect students to look at a problem in their research or other courses where perturbation methods could be used to solve the problem or gain additional insight. This requires graduate students to have a deeper understanding of the course material at a level that allows them to extend it to other applications.
12. Integrated Courses: This course will be integrated with a new graduate course SC/MATH 6940 3.0. As explained above the main separation in assessment between the undergraduate and graduate courses will be the expectation of course projects for graduate students. Completing this project will require a deeper understanding of the course material which is more suitable for a student at the graduate level.

13. Crosslisted Courses: N/A

14. Faculty Resources: Primary Faculty Member: Iain Moyles
   Alternate faculty members: Huaiping Zhu, Michael Haslam, Huaxiong Huang
   Frequency: every year
   Impact: The impact will be the requirement of one faculty member to teach this course. However, since the course is cross listed with a graduate course then two courses are being serviced by one instructor.

15. Physical Resources: This course will only require a lecture space for teaching. Any computational components required for the course will be able to be completed with personal computing resources. However, instructors may wish to use existing computer labs (e.g. the Gauss lab) to achieve course objectives.

16. Bibliography and Library Statement:

Please provide an appropriate and up-to-date bibliography in standard format. A statement from the University librarian responsible for the subject area certifying that adequate library resources are available for the new course must be provided.
MEMORANDUM
York University Libraries

To: Iain Moyles
From: William Denton
Date: 13 October 2022
Subject: Library Statement of Support – MATH 4940 and 6940 (Perturbation Methods)

Summary

York University Libraries (YUL) is well positioned to support the proposed course in both offerings. Faculty and students can make use of an array of library resources and services to meet their research and learning needs.

Collections

Prof. Moyles listed four books for the course. The main text is *Perturbation Methods* by E.J. Hinch (Cambridge, 1991), which we already have in print. To help support student needs I have ordered an electronic version of this slim 160-page volume. It costs $500 USD, which is unusually expensive, but it is free of any digital rights management, and the title adds to our collection in what seems to be a new topic for a mathematics course. I hope this will make both the teaching and learning easier (and also that one day perhaps a good open textbook will be available for the subject).

The other three books, for secondary use and consultation, are *Advanced Mathematical Methods for Scientists and Engineers I: Asymptotic Methods and Perturbation Theory* by Carl M. Bender and Steven A. Orszag (Springer, 1999), *Introduction to Perturbation Techniques* by Ali H. Nayfeh (Wiley, 2011) and *Introduction to Perturbation Techniques* by Mark. H. Holmes (Springer, 2013). We already have the third available as an ebook, and I have ordered one print copy each of the first two. (They are already available through Omni from other Ontario libraries, but again I am happy to add to our collection to support this new topic.)

For anyone interested in other books on perturbation theory and related topics, the Omni single-search interface provides students with access to a wide range of materials, including books, book chapters, articles, dissertations, etc. Library users may also request items from partner libraries through Omni. The A-Z list on the Libraries’ website provides a complete register of electronic offerings.

Services
Library Instruction

Librarians and archivists help students build research skills and digital fluencies through workshops, online research guides, and individual research assistance. Instructors can arrange a research skills workshop (or seminar) geared to a specific assignment, course, or competency.

Research Guides of Interest:

- Mathematics

Research Help

Online research assistance is available in both French and English via chat, text, and email. In addition, students and faculty can book one-hour research consultations with a specialist librarian. The Libraries also offer a virtual drop-in service hosted through Zoom for help in real-time.

Accessibility Services

Located on the first floor of the Scott Library (Keele Campus), Library Accessibility Services (LAS) provides alternative content formats, as well as adaptive technologies and spaces. With a referral, York University faculty and students can request transcription services or reserve an accessibility lab workstation.
New Course Proposal Template

The following information is required for all new course proposals. To facilitate the review/approval process, please use the headings below (and omit the italicized explanations below each heading).

1. **Program:** Mathematics and Statistics

2. **Course Number:** MATH 6940

3. **Credit Value:** 3.0

4. **Long Course Title:** Perturbation Methods

5. **Short Course Title:** Perturbation Methods

6. **Effective Session:** FW2023

7. **Calendar (Short) Course Description:** This course introduces perturbative methods as techniques for finding approximate solutions to mathematical problems. The course begins with approximating roots to polynomials before exploring applications in linear algebra, integrals, and differential equations.

8. **Expanded Course Description:** This course introduces students to the concept of formal perturbation expansions as a means of approximation. Beginning with polynomial roots students will learn the concept of regular and singular expansions and discuss the concepts of order and term balancing. Students will explore perturbative solutions in linear algebra to decouple nearly degenerate eigenvalues. They will explore a variety of techniques for asymptotically approximating integrals including Laplace’s Method, the method of steepest descent, and successive integration by parts. The concept of matched asymptotic expansions will be introduced through solving ordinary differential equations with boundary layers. Differential equations will also be used to introduce the concept of multiple timescales.

   Prerequisites: Students should have familiarity with calculus, linear algebra, and differential equations.

9. **Evaluation:**
   
   **Undergraduate:**
   Students will typically complete a series of homework assignments and a final exam.
   Homework 3*20%=60%
   Exam 40%

   **Graduate:**
   Students will typically complete a series of homework assignments, a project, and a final exam.
   Homework 3*16%=48%
   Project 20%
   Exam 32%

   The course project will typically expect students to look at a problem in their research or
other courses where perturbation methods could be used to solve the problem or gain additional insight. This requires graduate students to have a deeper understanding of the course material at a level that allows them to extend it to other applications.

10. **Integrated Courses:** This course will be integrated with a new course SC/MATH 4940 3.0. As explained above the main separation in assessment between the undergraduate and graduate courses will be the expectation of course projects for graduate students. Completing this project will require a deeper understanding of the course material which is more suitable for a student at the graduate level.

11. **Rationale:** This course will expand upon the techniques that graduate students in applied mathematics learn for solving problems. Perturbation methods lead students towards the concept of model reduction which can be used to better understand mechanistic processes that models are describing. Reduced models can simplify and speed up computations. They can also help uncover unidentifiable terms and parameters which can assist with data analysis and fitting. There is no direct overlap with any undergraduate or graduate courses currently on offer, but students will have some exposure to these ideas in MATH 6931, MATH 6655, MATH 6651, MATH 6652, and MATH 6937. While asymptotic methods may be used as needed in those courses, this course will provide students with a deeper rationale for why the methods work and when they are useful. This knowledge will compliment other technique and application courses in the program.

12. **Faculty Resources:** Primary Faculty Member: Iain Moyles
   Alternate faculty members: Huaiping Zhu, Michael Haslam, Huaxiong Huang
   Frequency: every year
   Impact: The impact will be the requirement of one faculty member to teach this course. However, since the course is cross listed with a graduate course then two courses are being serviced by one instructor.

   Provide the names of faculty members in your program qualified to teach this course. Stipulate the frequency with which you expect this course to be offered, including the impact that this course will have on faculty resources.

13. **Crosslisted Courses:** N/A

14. **Bibliography and Library Statement:**
   Please provide an appropriate and up-to-date bibliography in standard format. A statement from the University librarian responsible for the subject area certifying that adequate library resources are available for the new course must be provided.

15. **Physical Resources:** This course will only require a lecture space for teaching. Any computational components required for the course will be able to be completed with personal computing resources. However, instructors may wish to use existing computer labs (e.g. the Gauss lab) to achieve course objectives.
# Changes to Existing Course

**Faculty:** SCIENCE  
**Department:** Mathematics and Statistics  
**Date of Submission:** Nov 22 2022

**Course Number:** SC/MATH 1013  
**Effective Session:** FW23

**Course Title:** Applied Calculus I

**Type of Change:**

- [ ] in pre-requisite(s)/co-requisite(s)  
- [ ] in course number/level  
- [ ] in credit value  
- [ ] in title (max. 40 characters for short title)  
- [ ] in Calendar description (max. 40 words or 200 characters)  
- [ ] other (please specify):

**Change From:**

Course credit exclusions: SC/MATH 1300 3.00, SC/MATH 1505 6.00, SC/MATH 1530 3.00, SC/MATH 1550 6.00, GL/MATH/MODR 1930 3.00, AP/ECON 1530 3.00, SC/ISCI 1401 3.00 and SC/ISCI 1410 6.00.

**To:**

Course credit exclusions: SC/MATH 1300 3.00, SC/MATH 1505 6.00, SC/MATH 1506 3.00, SC/MATH 1530 3.00, SC/MATH 1550 6.00, GL/MATH/MODR 1930 3.00, AP/ECON 1530 3.00, SC/ISCI 1401 3.00 and SC/ISCI 1410 6.00.
This is to correct an oversight:

SC/MATH 1506 should have been listed as a course credit exclusion when the Course Proposal for SC/MATH 1506 was initially drafted, reviewed, and approved.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised 'Course Design' and 'Method of Instruction' information.
Changes to Existing Course

Faculty: SCIENCE

Department: Mathematics and Statistics

Course Number: SC/MATH 1014

Course Title: Applied Calculus II

Date of Submission: Nov 22 2022

Effective Session: FW23

Course Credit exclusions: SC/MATH 1014 3.00, SC/MATH 1310 3.00, SC/MATH 1310 3.00, SC/MATH 1540 6.00, GL/MATH/MODR 1940 3.00, AP/ECON 1540, SC/ISCI 1402 3.00, SC/ISCI 1410 6.00, SC/MATH 1505 6.00.

Type of Change:

- [x] in degree credit exclusion(s)
- [ ] in pre-requisite(s)/co-requisite(s)
- [ ] in course number/level
- [ ] in credit value
- [ ] in title (max. 40 characters for short title)
- [ ] in Calendar description (max. 40 words or 200 characters)
- [ ] other (please specify):

Change From:

Course Credit exclusions: SC/MATH 1014 3.00, SC/MATH 1310 3.00, SC/MATH 1540 6.00, GL/MATH/MODR 1940 3.00, AP/ECON 1540, SC/ISCI 1402 3.00, SC/ISCI 1410 6.00, SC/MATH 1505 6.00.

To:

Course Credit exclusions: SC/MATH 1014 3.00, SC/MATH 1310 3.00, SC/MATH 1540 6.00, GL/MATH/MODR 1940 3.00, AP/ECON 1540, SC/ISCI 1402 3.00, SC/ISCI 1410 6.00, SC/MATH 1505 6.00.
Rationale:

This is to correct an oversight:

SC/MATH 1507 should have been listed as a course credit exclusion when the Course Proposal for SC/MATH 1507 was initially drafted, reviewed, and approved.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised ‘Course Design’ and ‘Method of Instruction’ information.
# Changes to Existing Course

**Faculty:** SCIENCE  
**Department:** Mathematics and Statistics  
**Date of Submission:** Nov 22 2022  
**Course Number:** SC/MATH 1300  
**Effective Session:** FW23  
**Course Title:** Differential Calculus with Applications

## Type of Change:

- [ ] in pre-requisite(s)/co-requisite(s)  
- [ ] in course number/level  
- [x] in degree credit exclusion(s)  
- [ ] in cross-listing  
- [ ] regularize course (from Special Topics)  
- [ ] in course format/mode of delivery *  
- [ ] retire/expire course  
- [ ] other (please specify):

### Change From:

Course credit exclusions: SC/MATH 1013 3.00, SC/MATH 1505 6.00, SC/MATH 1530 3.00, SC/MATH 1550 6.00, GL/MATH/MODR 1930 3.00, AP/ECON 1530 3.00; SC/ISCI 1401 3.00, SC/ISCI 1410 6.00.

### To:

Course credit exclusions: SC/MATH 1013 3.00, SC/MATH 1505 6.00, SC/MATH 1506 3.0, SC/MATH 1530 3.00, SC/MATH 1550 6.00, GL/MATH/MODR 1930 3.00, AP/ECON 1530 3.00; SC/ISCI 1401 3.00, SC/ISCI 1410 6.00.
Rationale:

This is to correct an oversight:

SC/MATH 1506 should have been listed as a course credit exclusion when the Course Proposal for SC/MATH 1506 was initially drafted, reviewed, and approved.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised ‘Course Design’ and ‘Method of Instruction’ information.
# Changes to Existing Course

**Faculty:** SCIENCE  
**Department:** Mathematics and Statistics  
**Date of Submission:** Nov 22 2022  
**Course Number:** SC/MATH 1310  
**Effective Session:** FW23  
**Course Title:** Integral Calculus with Applications  

**Type of Change:**

- [ ] in pre-requisite(s)/co-requisite(s)  
- [ ] in course number/level  
- [ ] in credit value  
- [ ] in title (max. 40 characters for short title)  
- [ ] in Calendar description (max. 40 words or 200 characters)  
- [ ] other (please specify):  

- [x] in degree credit exclusion(s)  
- [ ] regularize course (from Special Topics)  
- [ ] in course format/mode of delivery *  
- [ ] retire/expire course  

**Change From:**

Course credit exclusions: SC/MATH 1014 3.00, SC/MATH 1505 6.00, GL/MATH/MODR 1940 3.00, SC/ISCI 1402 3.00, SC/ISCI 1410 6.00.  

**To:**

Course credit exclusions: SC/MATH 1014 3.00, SC/MATH 1505 6.00, SC/MATH 1507 3.0, GL/MATH/MODR 1940 3.00, SC/ISCI 1402 3.00, SC/ISCI 1410 6.00.
Rationale:

This is to correct an oversight:

SC/MATH 1507 should have been listed as a course credit exclusion when the Course Proposals for SC/MATH 1507 was initially drafted, reviewed, and approved.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised ‘Course Design’ and ‘Method of Instruction’ information.
# Changes to Existing Course

**Faculty:** SCIENCE  
**Department:** Mathematics and Statistics  
**Date of Submission:** Nov 22 2022  
**Effective Session:** FW23

**Course Number:** SC/MATH 1530  
AP/ECON 1530

**Course Title:** Introductory Mathematics for Economists I

**Type of Change:**

- in pre-requisite(s)/co-requisite(s)  
- in course number/level  
- in credit value  
- in title (max. 40 characters for short title)  
- in Calendar description (max. 40 words or 200 characters)  
- in cross-listing  
- in degree credit exclusion(s)  
- regularize course (from Special Topics)  
- in course format/mode of delivery *  
- retire/expire course  
- other (please specify):  

**Change From:**

Course credit exclusions: SC/MATH 1000 3.00, SC/MATH 1013 3.00, SC/MATH 1300 3.00, SC/MATH 1505 6.00, SC/MATH 1513 6.00, SC/MATH 1550 6.00, GL/MATH/MODR 1930 3.00.

**To:**

Course credit exclusions: SC/MATH 1000 3.00, SC/MATH 1013 3.00, SC/MATH 1300 3.00, SC/MATH 1505 6.00, SC/MATH 1506 3.0; SC/MATH 1513 6.00, SC/MATH 1550 6.00, GL/MATH/MODR 1930 3.00.
Rationale:

This is to correct an oversight:

SC/MATH 1506 should have been listed as a course credit exclusion when the Course Proposal for SC/MATH 1506 was initially drafted, reviewed, and approved.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised ‘Course Design’ and ‘Method of Instruction’ information.
Changes to Existing Course

Faculty: SCIENCE

Department: Mathematics and Statistics

Date of Submission: Nov 22 2022

Course Number: SC/MATH 1540

Effective Session: FW23

Course Title: Introductory Mathematics for Economists II

Course credit exclusions: SC/MATH 1505 6.00, SC/MATH 1550 6.00, GL/MATH/MODR 2650 3.00.

Type of Change:

☐ in pre-requisite(s)/co-requisite(s)
☐ in course number/level
☐ in credit value
☐ in title (max. 40 characters for short title)
☐ in Calendar description (max. 40 words or 200 characters)
☐ other (please specify):

☐ in cross-listing
☒ in degree credit exclusion(s)
☐ regularize course (from Special Topics)
☐ in course format/mode of delivery *
☐ retire/expire course

Change From:

Course credit exclusions: SC/MATH 1505 6.00, SC/MATH 1550 6.00, GL/MATH/MODR 2650 3.00.

To:

Course credit exclusions: SC/MATH 1505 6.00, SC/MATH 1507 3.0, SC/MATH 1550 6.00, GL/MATH/MODR 2650 3.00.
Rationale:

This is to correct an oversight:

SC/MATH 1507 should have been listed as a course credit exclusion when the Course Proposal for SC/MATH 1507 was initially drafted, reviewed, and approved.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised ‘Course Design’ and ‘Method of Instruction’ information.
Changes to Existing Course

Faculty: SCIENCE

Department: Mathematics and Statistics

Date of Submission: Nov 22 2022

Course Number: SC/MATH 1550

Effective Session: FW23

Course Title: Mathematics with Management Applications

Type of Change:

☐ in pre-requisite(s)/co-requisite(s)

☒ in degree credit exclusion(s)

☐ in cross-listing

☐ in course number/level

☒ in credit value

☐ in title (max. 40 characters for short title)

☐ in Course format/mode of delivery *

☐ in Calendar description (max. 40 words or 200 characters)

☐ retire/expire course

☐ other (please specify):

Change From:

Course credit exclusions: SC/MATH 1013 3.00, SC/MATH 1300 3.00, SC/MATH 1505 6.00, SC/MATH 1513 6.00, SC/MATH 1530 3.00, SC/MATH 1540 3.00, GL/MATH 1930 3.00, GL/MODR 1930 3.00, SC/ISCI 1401 3.00, SC/ISCI 1410 6.00, AP/ECON 1530 3.00, AP/ECON 1540 3.00.

To:

Course credit exclusions: SC/MATH 1013 3.00, SC/MATH 1300 3.00, SC/MATH 1505 6.00, SC/MATH 1513 6.00, SC/MATH 1506 3.00, SC/MATH 1507 3.0, SC/MATH 1513 6.00, SC/MATH 1530 3.00, SC/MATH 1540 3.00, GL/MATH 1930 3.00, GL/MODR 1930 3.00, SC/ISCI 1401 3.00, SC/ISCI 1410 6.00, AP/ECON 1530 3.00, AP/ECON 1540 3.00.
Rationale:

This is to correct an oversight:

SC/MATH 1506/1507 should have been listed as a course credit exclusion when the Course Proposals for SC/MATH 1506/1507 was initially drafted, reviewed, and approved.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised 'Course Design' and 'Method of Instruction' information.
### Changes to Existing Course

**Faculty:** Science  
**Department:** Natural Sciences  
**Course Number:** NATS 1650 6.00  
**Effective Session:** FW 2023-24  
**Date of Submission:** Sept. 19, 2022

<table>
<thead>
<tr>
<th>Type of Change:</th>
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</table>
| ☒ in title (max. 40 characters for short title) | ☒ in course format/mode of delivery: *LECT -> LECT, BLEN*  
| ☒ CCE clean-up | ☒ retire/expire course  

<table>
<thead>
<tr>
<th>Change From:</th>
<th>To:</th>
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</table>
| **Course Title:** Human Anatomy for the Fine Arts  
An introductory course on the structure and function of the human body specifically oriented towards the needs of students in Fine Arts. Body systems are studied from anatomical, physiological, and biomechanical perspectives. Included as well are on-going references to nutrition, athletic injuries, and health and wellness.  
Course credit exclusions: HH/KINE 2031 3.00, SC/NATS 1610 6.00, SC/NATS 1660 6.00, SC/NATS 1690 6.00.  
NCR: any student who has passed or is taking SC/BIOL 1000 3.00, SC/BIOL 1001 3.00 or SC/BIOL 1010 6.00. | **Course Title:** Introduction to Human Anatomy  
An introductory course on the structure and function of the human body specifically oriented towards the needs of students in Fine Arts. Body systems are studied from anatomical, physiological, and biomechanical perspectives. Included as well are on-going references to nutrition, athletic injuries, and health and wellness.  
Course credit exclusions: HH/KINE 2031 3.00, NATS 1610 6.00, GH 1001 3.00, GH 1002 3.00, KINE 1101 3.00, KINE 1102 3.00.  
NCR: any student who has passed or is taking SC/BIOL 1000 3.00, SC/BIOL 1001 3.00 or SC/BIOL 1010 6.00.|

**Rationale:**

**Title change:** The change in title is to better reflect the content of the course: it is a common misunderstanding that this course contains components of fine art, but it is in fact a human anatomy course designed as a science elective for arts/fine arts students.

**CCE change:** It is proposed that two courses (NATS 1660, NATS 1690) be removed as CCE, as the content no longer has substantial cross-over with NATS 1650. A statement of support from the Director of Natural Science is attached. Several newer courses are being proposed as CCE as they each have notable...
content cross-over with NATS 1650; this includes GH 1001 and GH 1002 Anatomy & Physiology for Human Health I and II, KINE 1101 and KINE 1102 Applied Human Anatomy and Physiology for Health Professionals I and II. **It should be noted that NATS 1650 was previously approved as a CCE for these courses, and is already listed as such in the undergraduate calendar, therefore statements of support were not sought.**

**Course format change:** This course can be delivered either in the existing in-person (LECT) format or in blended format (BLEN), enabling NATS to increase the availability of high-quality online components in courses while providing options for accommodating students’ diverse scheduling needs.

The rationale for the value of the BLEN format is as follows: Course grades (historical for ~5 years) and feedback from students (course evaluations, email, office hours) indicate that having the detailed anatomical lecture material available in an online format for review is highly beneficial for student learning. In addition, while we have been recording our lectures for many years (even when the course was taught in-person), we have not had the opportunity to incorporate many active learning strategies or timely feedback in the lecture component of the course, and since they are shown to improve student learning (Farmus et al., 2020, Phillips & Weisbauer, 2022) and student experience (Tolks et al., 2016), it is our intention to leverage the technology available to us and revise the course to a **blended and flipped format** to create an improved student learning experience. We believe this is especially important to achieve our learning outcomes related to integration of knowledge and application of anatomical knowledge to real-world scenarios. The laboratory component of this course will continue to be held in-person. Revised ‘Course Design’ and ‘Method of Instruction’ are provided below, as per page 4 of the New Course Proposal Form.


Course Design:
Indicate how the course design supports students in achieving the learning objectives. For example, in the absence of scheduled contact hours what role does student-to-student and/or student-to-instructor communication play, and how is it encouraged?

Detail any aspects of the content, delivery, or learning goals that involve "face-to-face" communication, non-campus attendance or experiential education components.

Alternatively, explain how the course design encourages student engagement and supports student learning in the absence of substantial on-campus attendance.

This course can be delivered either in the existing in-person (LECT) format or in blended format (BLEN). Both formats will continue to be supplemented with the existing in-person laboratory sessions, in which students apply their knowledge from lectures/online materials in a practical setting through weekly small group laboratories. Laboratories include examination of cadaveric specimens, models, skeletons and small group work.

When offered in the BLEN format, the course will consist of the following, in addition to the laboratory component:

- Asynchronous online materials amounting to ~2hrs of material every 2-3 weeks. This material includes short online screencasts, videos and H5Ps and will be posted in eClass. Videos include components of interactivity in the form of short quizzes, H5P, etc.
- In-person 2hr classes held once every 2-3 weeks (dependent on test dates, reading week, etc.) Student engagement will be encouraged through active learning activities that incorporate the online materials and allow students to apply that knowledge in a number of ways, for example through analysis of body movements or of clinical scenarios. They will work individually, in small groups, and as a full class, depending on the nature of each activity. Students will receive grades for their participation in active learning activities (tracked by iClicker). Decreasing in-person meetings will provide time for students to engage with online materials and prepare for in-person activities.

Instruction:

1. Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.).
2. Number of department members currently competent to teach the course.
3. Instructor(s) likely to teach the course in the coming year.
4. An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved, in order to indicate whether an effective length of term is being maintained OR in the absence of scheduled contact hours a detailed breakdown of the estimated time students are likely to spend engaged in learning activities required by the course.

1. No change.
2. Nicolette Richardson (current instructor), Janessa Drake, Loriann Hynes, Jaclyn Hurley.
3. Nicolette Richardson
4. In the current iteration, NATS 1650 has the following contact hours:
   - Face to face lectures: 2 hours/week x 24 weeks = 48 hours
   - Laboratories: 2 hours/week x 12 weeks = 24 hours
   - TOTAL HOURS: 72

The new iteration of the course will have the following contact hours:

- Face to face lectures: 2 hours/week x 13 = 26 hours
- Online activities: 2 hours/week x 11 = 22 hours
- Laboratories: 2 hours/week x 12 weeks = 24 hours
- TOTAL HOURS: 72
Sept 26, 2022

NATS Director’s Statement of Support for Removal of NATS1660 and NATS1690 as Course Credit Exclusions from NATS1650

We are conducting a review of the CCE and NCR listings for all NATS courses as a number of our courses have not been reviewed in several years.

The course topics for NATS1650, NATS1660 and NATS1690 have been reviewed and all 3 course directors have confirmed that the overlap (<10%) with NATS1650 is no longer significant enough to justify a course credit exclusion (CCE). The course descriptions for each are provided below. Separate forms for Changes to Existing Course are being submitted to reciprocate the removal of NATS1650 as a CCE for NATS1660 and NATS1690.

NATS1650 Human Anatomy for the Fine Arts*: An introductory course on the structure and function of the human body specifically oriented towards the needs of students in Fine Arts. Body systems are studied from anatomical, physiological, and biomechanical perspectives. Included as well are on-going references to nutrition, athletic injuries, and health and wellness.

NATS1660 The Biology of Sex: This course investigates the role of sexual reproduction in the living world. The cellular, physiological and genetic bases of sex are discussed. Other topics include sexual behaviour and the influence of sexual reproduction on evolution. A number of laboratory exercises are often included in this course.

NATS1690 Evolution: Origin and diversification of life forms on Earth. Introduction to the historical development of evolutionary theory. Classification of living things and scientific explanations of how biological diversity has arisen. A number of laboratory exercises are included in this course.

Robin Metcalfe, MSc, PhD
Director, Division of Natural Science
Department of Science, Technology & Society
Faculty of Science
York University

* NATS1650 is currently undergoing a proposed title change to “Introduction to Human Anatomy”
### COMMITTEE ON ACADEMIC STANDARDS, CURRICULUM AND PEDAGOGY

#### TEMPLATE

### NEW COURSE PROPOSAL FORM

<table>
<thead>
<tr>
<th>Faculty:</th>
<th>Science</th>
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<tr>
<td>Indicate all relevant Faculty(ies)</td>
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<tr>
<th>Department:</th>
<th>Department of Science, Technology, and Society; Division of Natural Science, (NATS)</th>
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<tr>
<td>Indicate department and course prefix (e.g. Languages, GER)</td>
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<tr>
<th>Date of Submission:</th>
<th>September 26, 2022</th>
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<table>
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<tr>
<th>Course Number:</th>
<th>NATS 1755</th>
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<tr>
<td>Special Topics courses Include variance (e.g. HUMA 3000C 6.0, Variance is &quot;C&quot;)</td>
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<tr>
<th>Academic Credit Weight:</th>
<th>Indicate both the fee, and MTCU weight if different from academic weight (e.g. AC=6, FEE=8, MET=6)</th>
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<table>
<thead>
<tr>
<th>Course Title:</th>
<th>Natural Hazards</th>
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<tbody>
<tr>
<td>The official name of the course as it will appear in the Undergraduate Calendar and on the Repository</td>
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<table>
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<tr>
<th>Short Title:</th>
<th>Natural Hazards</th>
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<tr>
<td>Appears on any documents where space is limited - e.g. transcripts and lecture schedules - maximum 40 characters</td>
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</table>

With every new course proposal it is the Department’s responsibility to ensure that new courses do not overlap with existing courses in other units. If similarities exist, consultation with the respective departments is necessary to determine degree credit exclusions and/or cross-listed courses.
Have you ever wondered why some areas of Earth experience reoccurring earthquakes or hurricanes every year while other areas have never experienced these events? Or have you wondered why the frequency of these natural hazards seems to be increasing in recent years? The study of the Earth and its processes helps us better understand the type, location, and intensity of natural hazards such as tsunamis, volcanoes, hurricanes, and earthquakes. In this course students examine the Earth processes that drive natural hazards and develop an understanding of how these hazards impact human society as well as the surrounding environment. Students analyze ways in which humans can better adjust to the impacts of natural hazards and discuss management and mitigation options and policies. The impact of climate change on the frequency and severity of natural hazards is discussed and potential solutions to climate change to minimize their impact is reviewed.

Prerequisites: None

Co-requisites: None

NCR: No credit will be retained for any student who has passed or is taking AP/DEMS 1701 3.00, AP/ADMS 1701 3.00, and/or LE/ESSE1410. Not open to any students enrolled in a Disaster and Emergency Management program.

CCE: SC/NATS1750 6.00, SC/NATS1780 6.00

In this course students examine the Earth processes that drive natural hazards. Students develop an understanding of how these hazards impact human society as well as the surrounding environment and the impact of climate change on their frequency and severity.

Prerequisites: None

Co-requisites: None

NCR: No credit will be retained for any student who has passed or is taking AP/DEMS 1701 3.00, AP/ADMS 1701 3.00, and/or LE/ESSE1410. Not open to any students enrolled in a Disaster and Emergency Management program.

CCE: SC/NATS1750 6.00, SC/NATS1780 6.00
### Expanded Course Description:

Please provide a detailed course description, including topics / theories and learning objectives, as it will appear in supplemental calendars.

### Topics

The course introduces students to aspects of natural hazards that occur on Earth and will be broken down into three themes: (1) Geoscience and Internal Structure of Earth, (2) Investigation of Natural Hazards, and (3) Investigation of Climate Change and its Impact on Natural Hazards. A brief introduction of what will be investigated in each theme is provided below:

1. **Geoscience and Internal Structure of Earth**
   - Investigation of the basic structure of Earth
   - Analysis of the processes that form and shape Earth’s surface
   - Define plate boundaries, their mechanisms and how their movement has changed the appearance of Earth’s surface over time
   - Investigation of plate tectonics and the two fundamental processes that drive it
   - Link structure of Earth’s surface to natural hazards

2. **Investigation of Natural Hazards**
   - A detailed investigation of several natural hazards will occur to understand formation, frequency, location of occurrence, intensity, impacts to Earth’s surface, risks to human society, etc.
   - Specific natural hazards that will be investigated are:
     - Earthquakes
     - Tsunamis
     - Volcanoes
     - Flooding
     - Atmospheric processes and severe weather
     - Hurricanes and extratropical cyclones
     - Coastal hazards
     - Wildfires

3. **Climate Change and its Impact on Natural Hazards**
   - Investigate the differences between climate and weather and how their variability is related to natural hazards
   - Discuss the structure, composition, and dynamics of the atmosphere and how these factors influence natural hazards
   - Summarize the contribution of humans to our changing climate
   - Link causes of climate change to natural hazards
   - Discuss how climate change may impact the severity and/or frequency of natural hazards
   - Review *Project Drawdown* and discuss solutions to climate change
Learning Outcomes:
Upon successful completion of this course students should be able to:

- Define the basic structure and processes of Earth
- Explain the mechanisms of plate tectonics and their link to understanding natural hazards
- Describe the mechanism of formation for several natural hazards
- Identify where certain types of hazards are most likely to occur on Earth’s surface
- Articulate the risks of natural hazards to human society
- Summarize how Earth’s climate has changed throughout history
- Describe the connection between climate change and natural hazards (particularly their severity and/or frequency)
- Analyze global natural hazard events through the completion of case study analyses
**Course Design:**

Indicate how the course design supports students in achieving the learning objectives. For example, in the absence of scheduled contact hours what role does student-to-student and/or student-to-instructor communication play, and how is it encouraged?

Detail any aspects of the content, delivery, or learning goals that involve "face-to-face" communication, non-campus attendance or experiential education components.

Alternatively, explain how the course design encourages student engagement and supports student learning in the absence of substantial on-campus attendance.

**Instruction:**

1. Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.).

2. Number of department members currently competent to teach the course.

3. Instructor(s) likely to teach the course in the coming year.

4. An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved, in order to indicate whether an effective length of term is being maintained OR in the absence of scheduled contact hours a detailed breakdown of the estimated time students are likely to spend engaged in learning activities required by the course.

This course is designed to be delivered either in-person or online (with in-person tests/exams)

**Lectures: (3 lecture hours/week = 36 hours)**

Lectures serve to introduce students to course concepts, clarify and expand on text readings, and offer students opportunities to work with course concepts through clicker questions, in-class discussion groups, and in-class case studies.

**Office hours: (2 office hours/week = 24 hours)**

Face-to-face and/or virtual office hours serve to provide opportunities for students to ask questions, clarify course concepts or review assignments/midterms.

1. One section in the fall, winter, or summer term

2. This course will be taught by faculty members in the Division of Natural Science with expertise in Environmental Science or related fields. Currently there are 5 department members competent to teach the course.

3. Stephanie Domenikos is expected to teach the initial offering of this course.

4. Students will meet with the course director for 3 hours per week of lecture contact, for a total of 36 per course. The course director will be available for weekly office hours, online for help sessions and by phone or email.

Students will need an additional 3-5 hours per week to do the readings, and assignments, for a total of 7-9 hours per week.
Evaluation:

A detailed percentage breakdown of the basis of evaluation in the proposed course must be provided.

If the course is to be integrated, the additional requirements for graduate students are to be listed.

If the course is amenable to technologically mediated forms of delivery please identify how the integrity of learning evaluation will be maintained. (e.g. will "on-site" examinations be required, etc.)

Activity Grade: 10 % (may include clickers, case studies, one-minute papers, think-pair-share, mini-quizzes, etc.)

Hazard City Assignments: 20 % (2% each x 11 assignments, lowest grade dropped)

Natural Hazard Research Assignment: 15 % total
- Proposal: 2 %
- Annotated Bibliography: 3 %
- Academic Poster/Final Paper: 10 %

Midterm 1: 15 % (will include multiple-choice, problem-solving, and short answer questions)

Midterm 2: 15 % (will include multiple-choice, problem-solving, and short answer questions)

Final Exam (in exam period): 25 % (will include multiple-choice, problem-solving, short and long answer questions)

Bibliography:

A READING LIST MUST BE INCLUDED FOR ALL NEW COURSES

The Library has requested that the reading list contain complete bibliographical information, such as full name of author, title, year of publication, etc., and that you distinguish between required and suggested readings. A statement is required from the bibliographer responsible for the discipline to indicate whether resources are adequate to support the course.

Also please list any online resources.

If the course is to be integrated (graduate/undergraduate), a list of the additional readings to be required of graduate students must be included. If no additional readings are to be required, a rationale should be supplied.

- Chapter 1: Introduction to natural hazards
- Chapter 2: Internal structure of earth and plate tectonics
- Chapter 3: Earthquakes
- Chapter 4: Tsunamis
- Chapter 5: Volcanoes
- Chapter 6: Flooding
- Chapter 9: Atmospheric processes and severe weather
- Chapter 10: Hurricanes and extratropical cyclones
- Chapter 11: Coastal hazards
- Chapter 12: Climate change and natural hazards
- Chapter 13: Wildfires
- Chapter 14: Impacts and extinctions
LIBRARY SUPPORT STATEMENT MUST BE INCLUDED.

Other Resources:
A statement regarding the adequacy of physical resources (equipment, space, etc.) must be appended. If other resources will be required to mount this course, please explain:

COURSES WILL NOT BE APPROVED UNLESS IT IS CLEAR THAT ADEQUATE RESOURCES ARE AVAILABLE TO SUPPORT IT.

This course will require the regular lecture hall facilities (with standard York University lecture hall IT equipment): classroom space for 150-200, as well as access to an eClass course.

Teaching assistants (T3) will be needed to assist with marking assignments and short answer questions on the midterms and exam.
Course Rationale:

The following points should be addressed in the rationale:

How the course contributes to the learning objectives of the program / degree.

The relationship of the proposed course to other existing offerings, particularly in terms of overlap in objectives and/or content. If inter-Faculty overlap exists, some indication of consultation with the Faculty affected should be given.

The expected enrolment in the course.

This course meets the requirements of York’s general education offerings in science, by introducing non-science students to the content and practice of Science.

The changing climate and natural hazards impact the lives of everyone on this planet. In this course, students will learn specific information regarding the mechanism behind natural hazards and identify when they become natural disasters (i.e. when they impact the livelihood of people or the environment they inhabit). For example, they will be able to apply Earth’s Plate Tectonic Theory to explain how the subduction of an ocean plate under a continental plate causes the formation of volcanoes and identify how the lava and ash output change the biosphere and atmosphere, respectively. Students will engage in activities, both in-class and at home through assignments, that will require them to go through the scientific process of developing a hypothesis, observing, and analyzing a set of data and inferring conclusions. This course provides students with the opportunity to better comprehend the impact that anthropogenic climate change is having on Earth, which may promote civic engagement for the protection of Earth’s natural systems. In addition, knowledge of Earth’s systems is directly applicable to areas of study such as agriculture, economics, business, urban planning, and politics.

In order to continue to offer students flexibility in meeting their general education requirements in science, the Division of Natural Science has sought to increase the number of 3 credit courses. There are currently no 3.0 NATS courses that focus entirely on natural hazards.

The expected enrolment is 150-200 students. The course could accommodate a larger class size and could also be adapted for a fully online offering.
**Faculty and Department Approval for Cross-listings:**

If the course is to be cross-listed with another department, this section needs to be signed by all parties. In some cases there may be more than two signatures required (i.e. Mathematics, Women’s Studies). In the majority of the cases either the Undergraduate Director or Chair of a unit approves the agreement to cross-list. All relevant signatures must be obtained prior to submission to the Faculty curriculum committee.

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<tr>
<th>Dept:</th>
<th>Signature (Authorizing cross-listing)</th>
<th>Department</th>
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Accessible format can be provided upon request.
I have reviewed the course proposal and bibliography for NATS 1755 – Natural Hazards and Extreme Weather and can state that the York University Libraries have the required resources to support this undergraduate level course.

Please be aware that the library offers the following services to help students with their research:

- A librarian can go to the classroom or tutorial and introduce students to the various resources available at the library including electronic journals, e-books, and databases.
- A librarian is also available for individual consultations with students to help them find the materials they need for their research.
- A librarian can be available as a user on the course Moodle page to answer student questions using the Forum discussion, provide links to resources in the course, and post handouts presented in face-to-face instruction.

I have searched the books listed in the course bibliography and ordered those titles that are not currently available through the library, please see the availability and ordering status of the textbooks below:

**Required text:**


If you would like to select print books or digitize course reading content and place them on reserve at the library for students’ use, please place a reserve request by visiting reserves.library.yorku.ca. For more information about course reserves, please visit: http://www.library.yorku.ca/web/ask-services/facultyinstructor-support/places-items-on-reserve/.

If the course will provide additional readings to students on Moodle, copyright compliance instruction may be requested through York University’s Copyright Support Office: http://copyright.info.yorku.ca.

The following electronic resources licensed by the library may be of help to the students in this course:

- **Web of Science** is a multidisciplinary citation database that indexes over 12,000 of the highest impact journals worldwide in the sciences, social sciences and humanities.
- **Environment Complete** contains records from domestic and international titles dating back to 1888. It offers coverage in many applicable areas including environmental technology, environmental law, public policy, social impacts, and urban planning.

A more complete listing of resources is available at the following Research Guides:
MEMORANDUM

- Natural Science: http://researchguides.library.yorku.ca/nats
- Environmental studies: https://researchguides.library.yorku.ca/environmentalstudies

Please note that the Steacie Library has extensive collections of books and reference materials that are relevant to this course.

In summary, I state that we are well positioned to support this course. If you have any questions, please do not hesitate to contact me.

Sincerely,

Minglu Wang, Research Data Management / Science Librarian
Steacie Science & Engineering Library
416-736-2100 x40075
mingluwa@yorku.ca
<table>
<thead>
<tr>
<th>Course Designation</th>
<th>Enrolment (Estimate or Last Offering)</th>
<th>Course(s) Created [X] or Modified to [☐] (check one)</th>
<th>Course(s) Retired [☐] or Modified from [☐]</th>
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<tr>
<td>SC/NATS1755 3.0 Natural Hazards</td>
<td>300</td>
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| Number of: | Lecture Sections: | 1 |
| Lab Sections: | 0 |
| Tutorial Sections: | 0 |

| Number of: | Course Coordinators (Tutor 1): | 0 |
| Lab Demonstrators (Tutor 2): | 0 |
| Mark/Graders (Tutor 3): | 1.4 TAship |

| Prerequisites (P) | Corequisites (C) | Credit Exclusions (E) | None |

| For which degree program is this required (if applicable)? | n/a |

| Other resource implications (please specify) | Lecture room |

| Reason(s) for creation/modification/retirement | Growing popularity of environmental-flavoured NATS courses, as evidenced by enrollment stats |
# Changes to Existing Course

**Faculty:** Science  
**Department:** Natural Sciences  
**Course Number:** NATS 1610 6.00  
**Course Title:** The Living Body  
**Date of Submission:** Oct 31, 2022  
**Effective Session:** FW 2023-24

## Type of Change:

- [ ] in pre-requisite(s)/co-requisite(s)  
- [ ] in course number/level  
- [ ] in credit value  
- [ ] in title (max. 40 characters for short title)  
- [ ] in Calendar description (max. 40 words or 200  
- [ ] other (please specify): CCE clean-up  
- [X] in course format/mode of delivery *

## Change From:  
LECT  

## To:  
LECT, BLEN

## Rationale:

NATS1610 is an introductory human physiology course and is recommended to Kinesiology students and to students planning to enter nursing programs. As a result, it’s a popular course and enrollments are always filled to capacity (i.e., 504 students pre-pandemic), with approximately 60% of students coming from the Faculty of Health.

From student comments over the past 2 years when the course was online, students appreciated the flexibility of accessing lecture material at their convenience, especially given the scheduling challenges for students in the Faculty of Health who are completing practicum requirements. The online lecture format resulted in better personal learning outcomes, as indicated by the higher final course averages during those two years. Also, the drop-out rate of the course decreased to 8-10% when fully online, from 12-14% when the course was in-person. Offering NATS1610 in the BLEN format offers students the flexibility of completing the lecture material at their own pace, then applying the knowledge gained from lectures in in-person active learning in small groups during the laboratory sessions.

One of the challenges of delivering course material via online asynchronous lectures is keeping students on track and ensuring that the lecture learning outcomes are achieved. To address this, the BLEN format will include asynchronous activities to deepen students’ learning of the key concepts, while synchronous online quizzes will motivate students to complete both the lecture material and asynchronous activities.
according to the course schedule.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised ‘Course Design’ and ‘Method of Instruction’ information.

Course Design:

Indicate how the course design supports students in achieving the learning objectives. For example, in the absence of scheduled contact hours what role does student-to-student and/or student-to-instructor communication play, and how is it encouraged?

Detail any aspects of the content, delivery, or learning goals that involve "face-to-face" communication, non-campus attendance or experiential education components.

Alternatively, explain how the course design encourages student engagement and supports student learning in the absence of substantial on-campus attendance.

This course can be delivered either in the existing in-person (LECT) format or in blended format (BLEN), enabling NATS to increase the availability of high-quality online components in courses while providing options for accommodating students’ diverse scheduling needs.

Both formats will continue to be supplemented with the existing in-person laboratory sessions and lab quizzes, in which students apply their knowledge from lectures/online materials in a practical setting through weekly small group laboratories.

When offered in the BLEN format, the course will consist of:

- Online Material
- Asynchronous online lectures
- Synchronous online quizzes, to motivate engagement with the lecture material
- Asynchronous online learning activities, to attain deeper learning of the lecture material
- Two in-person midterm tests
- Two in-person exams

The assessment structure for the BLEN format is as follows:

- 7 Online synchronous quizzes = 15%
- 7 Online learning activities = 5% (participation only)
- 2 Midterms and 2 Exams (in-person) = 55%
- 10 Lab Quizzes (in-person) = 12.5%
- 10 Lab Assignments (in-person) = 12.5%
Instruction:

1. Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.).

2. Number of department members currently competent to teach the course.

3. Instructor(s) likely to teach the course in the coming year.

4. An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved, in order to indicate whether an effective length of term is being maintained OR in the absence of scheduled contact hours a detailed breakdown of the estimated time students are likely to spend engaged in learning activities required by the course.

   1. No change.

   2. Barbara Czaban (current instructor), Jill Lazenby

   3. Barbara Czaban

   4. In the existing LECT format, NATS 1610 has a total of 92 contact hours, as follows:
      • In-person Lectures: 3 hours/week x 24 weeks = 72 hours
      • In-person Laboratories: 2 hours/week x 10 weeks = 20 hours

   In the BLEN format, the 92 contact/learning hours will consist of:
      • Online Lectures = 1.5 hours/week X 24 = 36 hours
      • Online activities and quizzes = 1.5 hours/week x 24 weeks = 36 hours
      • In-person Laboratories: 2 hours/week x 10 weeks = 20 hours
Changes to Existing Course

Faculty:  
Department: Natural Sciences  
Date of Submission: Nov. 1, 2022

Course Number: NATS 1670 6.00  
Effective Session: FW 2023-24

Course Title: Concepts in Human Health and Disease

Type of Change:  
- in pre-requisite(s)/co-requisite(s)  
- in course number/level  
- in credit value  
- in title (max. 40 characters for short title)  
- in Calendar description (max. 40 words or 200 characters)  
- in course format/mode of delivery *  
- in cross-listing  
- in degree credit exclusion(s)  
- regularize course (from Special Topics)  
- retire/expire course  
- other (please specify): Cancel tutorial hour

X other (please specify): Cancel tutorial hour

Change From: LECT, ONLN, ONCA

To: LECT, ONLN, ONCA, BLEN

Rationale: In the last six years or so, we had at the NATS division many discussions about the best teaching methods for supporting the different learning styles and scheduling needs of our students. As a result of these discussions I developed NATS1670 into a fully online course that was delivered since 2016 during the SU semester alongside the full “in-person” course during F/W, which I have been teaching since 2004. For NATS1670 F/W 2022-3, I am proposing to take the best from both methods and combine them together using flipped course strategies.

"What is a flipped classroom strategy?" Flipped lessons replace live, in-person lectures with instructional material — often a prerecorded lecture — that students watch and interact with at home. Later, they apply what they learned at home from the prerecorded lectures in in-class sessions through various activities.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

1 In a separate proposal, NATS1670 is being proposed for the ONCA format (online with in-person exams), as it has already been delivered in that format in previous years under the ONLN format code.
Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course.

Courses converted from face-to-face to an online delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised “Course Design” and “Method of Instruction” information.

**Course Design:**
Indicate how the course design supports students in achieving the learning objectives. For example, in the absence of scheduled contact hours what role does student-to-student and/or student-to-instructor communication play, and how is it encouraged? Detail any aspects of the content, delivery, or learning goals that involve “face-to-face” communication, non-campus attendance or experiential education components.

Alternatively, explain how the course design encourages student engagement and supports student learning in the absence of substantial on-campus attendance.

**In the BLEN format:**
- Lectures and discussions will be delivered in two different modes: First, students need to cover the relevant pre-recorded lecture/s on their own, and second, we will have in-class meetings for further discussions of the material covered in the pre-recorded lectures, but in greater depth.
- The pre-recorded lectures will cover all the material of the course. They are equivalent to the regular lectures we have in the LECT course format.
- In-person sessions will involve Q&A and guided discussions as well as exam review and exam take-up sessions
- There will also be online activities such as class forum discussions and collaborative material creation (eg, Wiki). The course director will monitor these activities and will contribute to the discussions as well.
- All exams (mid-terms and final) will take place in class only.

**Instruction:**
1. Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.).
2. Number of department members currently competent to teach the course.
3. Instructor(s) likely to teach the course in the coming year.
4. An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved, in order to indicate whether an effective length of term is being maintained OR in the absence of scheduled

1. At present, NATS1760 is offered in the ONLN or ONCA double-speed format during the SU term and in the LECT format in the FW term. This proposal provides the option to offer the course in the BLEN format during the FW term, in place of the LECT format. The enrollment is typically 200-300 students in each offering of the course.

2. Dr. Motti Anafi has been teaching NATS1670 since 2004.

3. Dr. Motti Anafi is available to teach the course in the coming years.

4. **In the existing LECT format:** The contact hours are 3 hours of in-person lecture per week, in addition to an optional 1hr per week for tutorial discussion (24 weeks x 3 hrs/week = 72 hours, plus 24 optional tutorial hours)
In the existing ONLN and ONCA formats: The learning hours are equivalent to 3 hours of asynchronous lecture material per week, in addition to an optional 1hr per week for asynchronous online discussion and/or online learning activities (24 weeks x 3 hrs/week = 72 hours, plus 24 optional discussion hours)

In the BLEN format, the learning/contact hours consist of:

- 1.5 learning hrs per week of asynchronous prerecorded lectures, covering the same topics as in the LECT/ONLN formats but with less depth
- 1.5 hrs of in-class discussion and learning activities, covering the topics with more depth, as required for achieving the learning outcomes and success on the exams
- 1 hr of optional online forum discussions and other online learning activities. These will take the place of the extra optional hour of contact/learning time currently offered in the LECT format

- In total:
  
  24 weeks x 1.5 hrs online asynchronous learning  
  24 weeks x 1.5 hrs in-person learning  
  24 weeks x 1 hr optional online asynchronous learning  
  = 72 hours, plus 24 optional learning hours)
Rationale:
Biodiversity and Conservation are global topics with local importance. This course was entirely redesigned and updated in 2020, after the beginning of the pandemic, with a new emphasis on citizen (or community) science as a means to teach the role of science in a changing world, while actively engaging students as participants in science. In particular, I designed a Community Science Project to help counter the fear, uncertainty, and lack of control the pandemic entailed by involving students directly in solving environmental questions and problems. The result was a population of students who were engaged in community science all over the world, online and in person, contributing to questions and solutions that were personally or locally important to them. Students then shared their experience in a capstone project, teaching their peers a diversity of environmental topics, questions, and how their Projects address them through peer assessment. By continuing to offer this course online, a wealth of expanded opportunities for Community Science is possible. NATS 1940 can leverage the diversity of York’s student body by engaging students all over the world in research projects that can be completed locally – a unique opportunity for an online, remotely taught course.
Because of the pandemic, I also redesigned the course from the ground up as an online course, with flexible lecture modes, online resources, online assessments, including rapid-feedback Quizzes and online Exams, opportunities to correct and improve learning, online Case Studies, and new modes of student support, such as Discord. NATS 1940 is now a flexible, student-centered course that can be run equally well as BLEN, ONLN or ONCA. As a BLEN course, I would utilize appointed hours for active engagement in active learning, case studies, as contact hours for student questions and support, and/or to assist students with finding and completing their Community Science Projects. The course can also be run asynchronously with support via Student Hours by appointment, and by online discussion forums such as Discord or email. An asynchronous format has benefits for international students due to the large differences in time zones.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised "Course Design" and "Method of Instruction" information.

Course Design:

Indicate how the course design supports students in achieving the learning objectives. For example, in the absence of scheduled contact hours what role does student-to-student and/or student-to-instructor communication play, and how is it encouraged?

Detail any aspects of the content, delivery, or learning goals that involve "face-to-face" communication, non-campus attendance or experiential education components.

Alternatively, explain how the course design encourages student engagement and supports student learning in the absence of substantial on-campus attendance.

This course can be delivered either in the existing in-person (LECT) format, online (ONLN) or in blended format (BLEN), enabling NATS to increase the availability of high-quality online components in courses while providing options for accommodating students’ diverse scheduling needs.

For BLEN, ONLN and ONCA:

- A series of short asynchronous lectures will be posted on a weekly basis. Some lecture materials may include short videos from online resources that are interactive (e.g., from HHMI BioInteractive), or include study guides. Pre-recorded asynchronous lectures also include active learning questions where students are encouraged to pause and answer a knowledge check question or apply concepts to a mini-case study before moving on in the lecture.

- Each week students complete a Quiz or Quiz Redo. Quizzes consist of multiple-choice questions and one or two written questions, with marking / feedback provided at the end of the week. Students have the optional opportunity to Redo the Quiz to correct their answers and earn a higher mark the following week. The lowest one or two quiz scores are dropped (depending on the speed of the course).

- Students also complete 4 low-stakes exams, with one dropped score.
In the ONLN format (typically to be offered in the summer term), the exams will be held online. In the BLEN or ONCA format, they will be held in person.

- To encourage engagement with their peers, participation marks are awarded for guided asynchronous online discussions on eClass.

- Students also complete Case Studies using a variety of online media to explore, for example, the impact of global warming on coral reefs and the benefits and tradeoffs of wolf reintroduction.

- Finally, students complete the Community Science Project. All students must have their Project Choice approved, and the assignment is scaffolded such that students learn about the background, motivation, and results of their Project in stages, then share a summary of their Project, its importance, and their experience through a Final Report. Final Reports may take any number of creative digital formats (presentations, posters, podcasts, even documentaries!), again taking advantage of the online format. Students peer-assess each other’s Reports while learning about a variety of environmental topics through different Projects completed by their peers. Although students complete these Projects independently, online forums via Discord will allow students who happen to choose the same Project to support each other remotely.

For BLEN only:

- Two hours will be set aside every 2 weeks for in-person activities. These mandatory sessions will be used to support the Community Science Project, to review short case studies or examples that reinforce lecture topics through active learning (iClicker or other online tools), to conduct interactive Exam Reviews and other active-learning activities as needed.

For ONLN only:

- Student contact hours will be offered by appointment to allow for international time zones. Student support will also be offered via online forums (ex: Discord, eClass) and email.
**Instruction:**

1. Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.).

2. Number of department members currently competent to teach the course.

3. Instructor(s) likely to teach the course in the coming year.

4. An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved, in order to indicate whether an effective length of term is being maintained OR in the absence of scheduled contact hours a detailed breakdown of the estimated time students are likely to spend engaged in learning activities required by the course.

   1. No change.

   2. Robin Marushia (current instructor), Birgit Schwarz, Mark Vicari

   3. Robin Marushia

   4. In the BLEN and ONLN versions of the course, students will receive the equivalent of 3 lecture hours of asynchronous online lecture content per week, similar to a lecture course. During weeks when the BLEN version has a 2-hour in-person session, the ONLN format will have equivalent online active-learning activities to engage students with the same content in an online group setting, for example via guided online discussions and peer-to-peer activities.

      In all formats, 24 weeks x 3 hours/week of content = 72 contact/learning hours
**Changes to Existing Course**

**Faculty: Science**

<table>
<thead>
<tr>
<th>Department:</th>
<th>Natural Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Number:</td>
<td>NATS 1920 6.00</td>
</tr>
<tr>
<td>Course Title:</td>
<td>Nature and Growth Of Ideas in Mathematics</td>
</tr>
</tbody>
</table>

**Date of Submission:** Nov. 14, 2022  
**Effective Session:** FW 2023-24

**Type of Change:**
- [ ] in pre-requisite(s)/co-requisite(s)
- [ ] in course number/level
- [ ] in credit value
- [X] in title (max. 40 characters for short title)
- [ ] in Calendar description (max. 40 words or)
- [ ] in cross-listing
- [ ] in degree credit exclusion(s)
- [ ] regularize course (from Special Topics)
- [ ] in course format/mode of delivery: *
- [ ] retire/expire course

**Change From:**

<table>
<thead>
<tr>
<th>Course Title:</th>
<th>Nature and Growth Of Ideas in Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students are shown the central position of mathematics in our culture: great discoveries in mathematics and their effect on general culture and society; history of mathematics; mathematics of art and architecture, sound, games and gambling and computing.</td>
<td></td>
</tr>
</tbody>
</table>
| CCEs: NONE  
NCRs: NONE  
Delivery Format: LECT |

**To:**

<table>
<thead>
<tr>
<th>Course Title:</th>
<th>Nature and Growth Of Ideas in Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students are shown the central position of mathematics in our culture: great discoveries in mathematics and their effect on general culture and society; history of mathematics; mathematics of art and architecture, sound, games and gambling and computing.</td>
<td></td>
</tr>
</tbody>
</table>
| CCEs: NONE  
NCRs: NONE  
Delivery Format: LECT, ONCA |

**Rationale:** As there is a limited number of in-person NATS courses that can be offered at the new Markham campus, we need to ensure that Markham students have access to NATS courses in all of our subject areas. At present, our math-themed courses have no online options. Of our four math courses, NATS1920 lends itself best to the online format as the content is mathematics taught using a story-telling framework which can be delivered.
effectively in pre-recorded lectures. In addition, as NATS1920 attracts students with strong as well as weak mathematical backgrounds, recorded lectures allow students with weaker backgrounds to work at their own pace. Videos can be paused and rewatched as often as necessary. Lastly, by offering the course in the asynchronous online format, it will be easier for Markham students to fit the course into their diverse scheduling needs.

Depending on enrollment, we hope to continue offering the course in the LECT format in addition to the ONCA format, either simultaneously or in alternating years.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an online delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised “Course Design” and “Method of Instruction” information.

Course Design:
Indicate how the course design supports students in achieving the learning objectives. For example, in the absence of scheduled contact hours what role does student-to-student and/or student-to-instructor communication play, and how is it encouraged?
Detail any aspects of the content, delivery, or learning goals that involve "face-to-face" communication, non-campus attendance or experiential education components.
Alternatively, explain how the course design encourages student engagement and supports student learning in the absence of substantial on-campus attendance.

This course can be delivered either in the existing in-person (LECT) format or in the asynchronous online format with in-person assessments (ONCA).

The design of the ONCA format is as follows:

- 2-3 hours of asynchronous lecture content will be posted on a weekly basis.
- A 1.5-hour synchronous online problem-solving tutorial, held every other week. Tutorial questions are posted prior to the scheduled tutorial. Students are encouraged to attempt/view the problems before the synchronous tutorial.
- As in the LECT format, students will complete an in-person exam in the Fall and Winter exam periods. Markham students may be able to write their exams at the Markham campus if space is available.

The evaluation scheme in the ONCA format is as follows:

- 8 Assignments, evenly spaced throughout the Fall and Winter semester, worth 60% in total
- In-person mid-term and final exam worth 20% each
**Instruction:**

1. Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.).

2. Number of department members currently competent to teach the course.

3. Instructor(s) likely to teach the course in the coming year.

4. An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved, in order to indicate whether an effective length of term is being maintained OR in the absence of scheduled contact hours a detailed breakdown of the estimated time students are likely to spend engaged in learning activities required by the course.

1. NATS1920 will be offered in the ONCA format in FW23-24 and FW 24-25. After that, it may be offered either simultaneously with the LECT format or with the deliver formats offered in alternate years.

2. We currently have 2 full-time department members competent to teach this course.

3. Prof. Carly Rozins will be teaching the course in FW23-24.

4. In the ONCA format, the course will involve a total of **72 learning hours** comprised of the following:
   - 2.5 hrs x 24 weeks = 60 asynchronous learning hours
   - 1.5 hr x 8 weeks = 12 synchronous learning hours
Changes to Existing Course

Faculty: Science  
Department: STS/NATS  
Date of Submission: 31-Oct-2022  
Course Number: NATS1570 3.0  
Effective Session: FW23/24

Course Title: Exploring the Solar System

Type of Change:
- in pre-requisite(s)/co-requisite(s)
- in course number/level  
- in credit value  
- in title (max. 40 characters for short title)  
- in Calendar description (max. 40 words or 200 characters)
- other (please specify): CCE

Change From:  
This course considers the science of the Solar System, including the structure of the planets and other objects within it, as well as its dynamic processes. Course credit exclusions: SC/NATS 1740 6.00, SC/NATS 1880 6.00, SC/NATS 1750 6.00. NCR: to any student who has successfully taken or is taking SC/PHYS 1070 3.00 or SC/PHYS 1470 3.00. Not open to any students enrolled in the Astronomy Stream.

To:  
This course considers the science of the Solar System, including the structure of the planets and other objects within it, as well as its dynamic processes. Course credit exclusions: SC/NATS 1740 6.00, SC/NATS 1880 6.00, SC/NATS 1750 6.00. NCR: to any student who has successfully taken or is taking SC/PHYS 1070 3.00 or SC/PHYS 1470 3.00. Not open to any students enrolled in the Astronomy Stream.

Rationale:  
SC/NATS1570 3.0 (Exploring the Solar System), is a course about the structure and dynamic processes of the planets in our solar system, including Earth. SC/NATS1750 6.0 (The Earth and its Atmosphere) focuses entirely on the structure and dynamic processes of Earth. The degree of overlap is too minimal (under 10%) to justify a course credit exclusion. A statement of support from the Director of Natural Science is attached.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an online delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised ‘Course Design’ and ‘Method of Instruction’ information.
Changes to Existing Course

Faculty: Science  
Department: STS/NATS  
Date of Submission: 31-Oct-2022  
Course Number: NATS1750 6.0  
Effective Session: FW23/24  
Course Title: The Earth and its Atmosphere

Type of Change:
- [ ] in pre-requisite(s)/co-requisite(s)
- [ ] in course number/level
- [ ] in credit value
- [ ] in title (max. 40 characters for short title)
- [ ] in Calendar description (max. 40 words or 200 characters)
- [X] other (please specify): NCR and CCE clean-up

Change From:
In this course we describe the physical properties and characteristics of Earth as an active system. We will look at the overall structure of Earth and how it is a dynamic system. Plate tectonics, the constantly changing surface of Earth, the nature of water and oceans and the atmosphere will be covered. We will also address how these different elements interact. We will touch briefly on other solar system bodies, and how they may be similar to or different from Earth. We will also look at how geology plays a role in the mineral resources on Earth. The effect and interaction with life will also be touched on. Course credit exclusions: SC/NATS 1570 3.00, SC/NATS 1780 6.00, LE/EATS 1010 3.00, SC/EATS 1011 3.00, SC/EATS 1011 3.00. Not open to any student who has passed or is taking a course in earth and atmospheric science. PRIOR TO SUMMER 2013: Course credit exclusions: SC/NATS 1780 6.00, SC/EATS 1010 3.00, SC/EATS 1011 3.00.

To:
In this course we describe the physical properties and characteristics of Earth as an active system. We will look at the overall structure of Earth and how it is a dynamic system. Plate tectonics, the constantly changing surface of Earth, the nature of water and oceans and the atmosphere will be covered. We will also address how these different elements interact. We will touch briefly on other solar system bodies, and how they may be similar to or different from Earth. We will also look at how geology plays a role in the mineral resources on Earth. The effect and interaction with life will also be touched on. Course credit exclusions: SC/NATS 1515 3.00, SC/NATS 1570 3.00, SC/NATS 1755 3.00, SC/NATS 1780 6.00, LE/EATS 1010 3.0, SC/EATS 1010 3.00, LE/EATS 1011 3.00, SC/EATS 1011 3.00. NCR: LE/ESSE 1011 3.0. Not open to any student who has passed or is taking a course in earth and atmospheric science. PRIOR TO SUMMER 2013: Course credit exclusions: SC/NATS 1780 6.00, SC/EATS 1010 3.00, SC/EATS 1011 3.00.

Rationale:
• Removal of NATS1570 as a CCE: SC/NATS1570 3.0 (Exploring the Solar System), is a course about the structure and dynamic processes of the planets in our solar system, including Earth. SC/NATS1750 6.0 (The Earth and its Atmosphere) focuses entirely on
the structure and dynamic processes of Earth. The degree of overlap is too minimal (under 10%) to justify a course credit exclusion. A statement of support from the Director of Natural Science is attached.

- **Addition of NATS1515 as a CCE**: SC/NATS1515 3.0 Atmospheric Pollution has NATS1750 listed as CCE, thus the exclusion needs to be reciprocated. A statement of support from the Director of Natural Science is attached.

- **Addition of NATS1755 as a CCE**: SC/NATS1755 3.0 Natural Hazards is a new course proposal for FW23-24 approved (with friendly ammendements) by the FSc Curriculum Committee in Oct 22. NATS1750 is listed as a CCE for NATS1755 so the exclusion needs to be reciprocated. A statement of support from the Director of Natural Science is attached.

- **Removal of EATS1010 as a CCE**: LE/EATS 1010 3.0 and SC/EATS 1010 3.0 (The Dynamic Earth and Space Geodesy) have not been offered in 7+years and can therefore be removed, as per Senate Policy on Course Cross-listings, Exclusions and Substitutions, which states “Previous codes from courses not offered for seven consecutive years shall be removed from course descriptions.”

- **Removal of SC/EATS 1011 as a CCE**: SC/EATS 1011 3.0 is now LE/ESSE 1011 3.0 and has not been cross-listed with SC for over 7 years.

- **Redesignation of LE/ESSE 1011 as NCR**: LE/ESSE 1011 (Introduction to Atmospheric Science) has a considerable degree of overlap with NATS1750. NCR is the more appropriate designation than CCE as NATS1750 is designed specifically for non-science majors and therefore not equivalent in depth and complexity to ESSE 1011, a required course as part of the degree in Atmospheric Science. An email communication indicating support from the ESSE UDP is attached.

- The text “Not open to any student who has passed or is taking a course in earth and atmospheric science” is too general and too challenging to impose, as earth science is a broad area that includes numerous topics not covered in NATS1750. Removal of ‘earth and’ conveys the appropriate restriction.

- The text “Prior to summer 2013…” can be removed, as per Senate Policy on Course Cross-listings, Exclusions and Substitutions (stated above).

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Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised “Course Design” and “Method of Instruction” information.
Dear Dr. Metcalfe,

Sorry for the late reply. I discussed it with colleagues. Yes, CCEs should be removed. We support your proposal.

Thanks,

Yongsheng

Yongsheng Chen, PhD, Associate Professor
Undergraduate Program Director for Earth and Atmospheric Science
Department of Earth and Space Science and Engineering
Room 249A Petrie Science and Engineering Bldg.
York University, 4700 Keele Street, Toronto, Ontario, M3J 1P3
Tel: 416-736-2100 ext. 40124 | Fax: 416-736-5817
Email: yochen@yorku.ca

On Thu, Sep 29, 2022 at 11:45 AM natsdir <natsdir@yorku.ca> wrote:

Dear Dr. Chen, very sorry to email you again about this but we’d like to get this change on the agenda for our upcoming curriculum meeting. To quickly summarize, ESSE1011 and NATS1750 both list each other as CCEs. Both myself and the previous NATS Director believe this is an error, as evidenced by the text that follows the CCEs listed for NATS1750: “Not open to any student who has passed or is taking a course in earth and atmospheric science.” This statement makes it impossible for an ESSE student to take NATS1750, so there is no reason for the CCE to exist.

If I’m wrong about this, please let me know. Otherwise, I would very much appreciate if you could send me a quick statement indicating your agreement that the CCEs should be removed from each other. Instead, we will add ESSE1011 as an NCR for NATS1750.

Again, please feel free to contact me about this if you have questions.

Cheers,
Robin Metcalfe

Please note that you can expect replies to emails on weekdays between 8am-4pm excluding holidays. If your working hours are different than mine, please do not feel obligated to reply outside your normal working hours. Thank you and have a great day!
Dear Prof. Chen,

I am in the process of reviewing the Course Credit Exclusions for our NATS courses. It appears that NATS1750 Earth and its Atmosphere has ESSE1011 listed as a CCE (and vice versa) owing to a significant overlap in course content. It is unusual for a NATS course to have CCEs with courses outside of NATS, especially for core courses in a BSc program, as NATS courses are specifically designed for non-science majors. I have spoken to the previous NATS director as to the origin of this CCE listing – it appears to have been inherited from a number of years ago and she supports its removal. Instead, we would list ESSE1011 as an NCR for NATS1750, to prevent ESSE students from taking it as an elective.

In order for us to proceed with this change, I would need a statement from yourself, indicating that you support the change from CCE to NCR as ESSE1011 and NATS1750 should not be considered equivalent courses from a credit standpoint.

Thanks very much for your time! I’m happy to chat further if you have any questions or concerns about this.

Cheers,
Robin Metcalfe

Please note that you can expect replies to emails on weekdays between 8am-4pm excluding holidays. If your working hours are different than mine, please do not feel obligated to reply outside your normal working hours. Thank you and have a great day!
**********
Robin Metcalfe, M.Sc, Ph.D
Director and Associate Professor, Division of Natural Science

Department of Science, Technology and Society
Faculty of Science
York University
Changes to Existing Course

Faculty: Science
Department: Natural Science
Date of Submission: 25-Oct-2022
Effective Session: FW2023-24

Course Title: Various

Type of Change:
- in pre-requisite(s)/co-requisite(s)
- in course number/level
- in credit value
- in title (max. 40 characters for short title)
- in Calendar description (max. 40 words or 200 characters)
- in cross-listing
- in degree credit exclusion(s)
- regularize course (from Special Topics)
- X in course format/mode of delivery *
- retire/expire course
- other (please specify):

Change From:
LECT, BLEN (NATS1530 & NATS1670), ONLN

To:
LECT, BLEN (NATS1530 & NATS1670), ONLN, ONCA

Rationale:
The courses listed in this form have been regularly offered in the LECT and ONLN formats prior to the pandemic (ie, before the 2019-20 academic term) and (depending on the term) have required students to attend in-person final exams during the official examination periods. The option of using the new ONCA code will provide clarification to students regarding this requirement.

As NATS courses are typically offered in different formats throughout the term, we would like to retain the ONLN format code option for all of these courses, enabling us to offer either ONLN or ONCA format as needed.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised “Course Design” and “Method of Instruction” information.

1 NATS1530 was approved in the BLEN format pre-pandemic. We have submitted a separate proposal for offering NATS1670 in the BLEN format for FW23.
Non-Major Modification Program Changes

1. Program: Neuroscience

2. Degree Designation: Specialized Honours BSc

3. Type of Modification: (Example: changes to degree / admission requirements) Re-adding SC/BIOL 2060 3.0 as degree requirement

4. Effective Date: Fall 2023

5. State what the changes are (Example: increase / decrease to the number of major credits)

   The Neuroscience program originally included SC/BIOL 2060 3.0 as a degree requirement, however the Non-Major Modification that was submitted last year mistakenly removed the course and instead listed HH/PSYC 2021 3.00 or HH/KINE 2050 3.00. This proposal will re-add the BIOL 2060 course as a degree requirement and subsequently allow Neuroscience students the choice of completing one of three statistics courses for their program.

6. Provide the rationale for the proposed changes that is rooted in the program learning outcomes.

   No change to the program learning outcomes as the proposal always included a statistic course requirement.

7. Provide an updated mapping of the program requirements to the program learning outcomes to illustrate how the proposed requirements will support the achievement of program learning objectives.

   No change to the mapping of the program requirements to the program learning outcomes as the BIOL 2060 was originally included when the program was created. It’s removal from calendar copy was an error.

8. If relevant, summarize the consultation undertaken with relevant academic units, including commentary on the impact of the proposed changes on other programs. Provide individual statements from the relevant program(s) confirming consultation and their support.

   n/a -- the original Neuroscience program proposal passed by Senate already included the consultation with the Faculty of Science and Faculty of Health departments with respect to having BIOL 2060, PSYC 2021 and KINE 2050 as a degree requirement.

9. Describe any resource implications and how they are being addressed (e.g., through a reallocation of existing resources). If new/additional resources are required, provide a statement from the relevant Dean(s)/Principal confirming resources will be in place to implement the changes.

   n/a -- the original Neuroscience program proposal passed by Senate already included any resource complications and this minor change does not required any changes to resources.
10. Provide a summary of how students currently enrolled in the program will be accommodated.

As previously stated this change will allow students with more choice with respect to their statistics course requirement.
11. Provide as an appendix a side-by-side comparison of the existing and proposed program requirements as they will appear in the Undergraduate or Graduate Calendar.

<table>
<thead>
<tr>
<th>Specialized Honours BSc Program in Neuroscience (120 Credits)</th>
<th>Specialized Honours BSc Program in Neuroscience (120 Credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major credits:</strong> students must complete a minimum of 64 credits in neuroscience major.</td>
<td><strong>Major credits:</strong> students must complete a minimum of 64 credits in neuroscience major.</td>
</tr>
<tr>
<td>- SC/BIOL 1000 3.00</td>
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<td>- 12 credits selected from the list of courses in the chosen specialized stream</td>
<td>- 12 credits selected from the list of courses in the chosen specialized stream</td>
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<td>- 12 credits selected from the list of courses in each of the two alternative specialized streams with a minimum of 3 credits required from each stream.</td>
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</tbody>
</table>
November 14, 2022

Dear Faculty of Science Curriculum Committee Members,

As you may know, the Geography Program was enveloped into the BSc in Environmental Science, Environmental Dynamics Stream, at the Faculty of Environmental and Urban Change (EUC). And because the home academic unit is still the Faculty of Science (FSc), the closure of this program requires going through our faculty governance. This process started in 2020 with a Notice of Intent (NOI) and went through governance at the EUC. However, in order for the program to be closed, the program closure proposal needs to be approved by the FSc Curriculum Committee and the FSc Council.

It is noteworthy that there are a few students currently enrolled in the program and the EUC is planning to accommodate the existing students through a combination of courses offered through the Global Geography and Environmental Science programs.

I hope the committee will be able to discuss this matter at the upcoming curriculum meeting and proceed accordingly.

If you require further information, please do not hesitate to contact me at 416-736-5051 or email at sciadcp@yorku.ca.

Sincerely,

Hovig Kouyoumdjian
Associate Dean, Curriculum and Pedagogy
Closure of an Undergraduate or Graduate Program

I. Program Information

<table>
<thead>
<tr>
<th>Name and Type of Program</th>
<th>BSc Geography</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Academic Unit</td>
<td>EUC</td>
</tr>
<tr>
<td>Year Program Established</td>
<td></td>
</tr>
</tbody>
</table>

II. Enrolment Data

Insert in the table below the enrolments in the program the past three academic years.

<table>
<thead>
<tr>
<th>[FW22]</th>
<th>[8]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[FW21]</td>
<td>[13]</td>
</tr>
<tr>
<td>[FW20]</td>
<td>[23]</td>
</tr>
</tbody>
</table>

III. Reasons and Impact

1. Provide the rationale for the closure of the program. We do not have the capacity to deliver the program at this time (but hope that we can deliver a BSc in Geography through the Faculty of Environmental and Urban Change at a later date). With the establishment of EUC, some programs were closed. A NOI was submitted in 20-21’ to close the BSc Geography, this document is the follow-up.

2. Comment on the alignment between the closure and Faculty and/or University academic plans. The BSc in Geography was enveloped into a BSc in Environmental Science, Environmental Dynamics Stream.

3. Does the closure affect other programs / units? If yes, describe the impact of the closure on them. BSc Geography was a joint program with the Department of GEOG and the Faculty of Science. Students enrolled through the Faculty of Science. FOS is aware that the program is closing.

4. Are there courses that were established specifically to support the learning outcomes of the program? If so, describe the status of those courses after the closure of the program. No,

5. Describe the impact of the closure on students currently enrolled in the program, including an outline of the provisions for students to complete it, the timelines and availability to transfer credits to other programs. We are able to accommodate
existing students through a combination of courses offered through the Global Geography and Environmental Science programs.

6. What is the impact on faculty members affiliated with the program? None – they are working in the Environmental Science and Global Geography programs.

7. What are the general implications for the diversity and availability of academic programming? NA
Changes to Existing Course

Faculty: Science
Department: Physics and Astronomy
Date of Submission: September 2022
Course Number: PHYS 4270
Effective Session: Fall 2023
Course Title: Astronomical Techniques

Type of Change:

- [x] in pre-requisite(s)/co-requisite(s)
- [] in course number/level
- [] in credit value
- [] in title (max. 40 characters for short title)
- [] in Calendar description (max. 40 words or 200 characters)
- [] other (please specify):

Change From:
Prerequisites: SC/PHYS 1070 3.0; AS/SC/MATH 2271 3.0
Prerequisite or Corequisite: SC/PHYS 3220 3.0.

To:
Prerequisites: SC/PHYS 1070 3.0; SC/PHYS 2070 3.0;
AS/SC/MATH 2271 3.0
Prerequisite or Corequisite: SC/PHYS 3220 3.0.
PHYS 4270 3.0 is a course in observational astronomy and astrophysics which builds on key previous courses taken by astronomy majors. All astronomy majors are required to take PHYS 1070 3.0 ‘Fundamentals of Astronomy’, PHYS 2070 3.0 ‘Galaxies and the Universe’, and PHYS 4270 3.0. By now requiring PHYS 2070 in addition to PHYS 1070 to be a prerequisite to PHYS 4270, we aim to ensure that students understand the natural progression of those courses: students are exposed to observational concepts such as coordinate systems and sidereal time in PHYS 1070, build on those same concepts in PHYS 2070, and further solidify and put to use their understanding of those concepts in PHYS 4270. Requiring students taking PHYS 4270 to have taken PHYS 2070 as a prerequisite will avoid having to devote precious time in PHYS 4270 to reviewing those concepts.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised ‘Course Design’ and ‘Method of Instruction’ information.
COMMITTEE ON ACADEMIC STANDARDS, CURRICULUM AND PEDAGOGY
TEMPLATE

NEW COURSE PROPOSAL FORM

Faculty:  
Indicate all relevant Faculty(ies)  

Science

Department:  
Indicate department and course prefix (e.g. Languages, GER)  

Physics and Astronomy PHYS

Date of Submission:  
Oct 31, 2022

Course Number:  
Special Topics courses Include variance (e.g. HUMA 3000C 6.0, Variance is "C")  

PHYS 3600 Var:  

Academic Credit Weight:  
Indicate both the fee, and MTCU weight if different from academic weight (e.g. AC=6, FEE=8, MET=6)  

3

Course Title:  
The official name of the course as it will appear in the Undergraduate Calendar and on the Repository  

Experiential Learning Opportunity through Research and Exchange (EXPLORE)

Short Title:  
Appears on any documents where space is limited - e.g. transcripts and lecture schedules - maximum 40 characters  

EXPLORE

With every new course proposal it is the Department’s responsibility to ensure that new courses do not overlap with existing courses in other units. If similarities exist, consultation with the respective departments is necessary to determine degree credit exclusions and/or cross-listed courses.
Students engage and collaborate in cutting-edge scientific research as part of an international team of faculty mentors and student peers from other universities in Canada and in other countries. Students read scientific literature, learn the process of scientific research, make oral and written presentations, and participate in research team activities using virtual workspaces and remote collaboration tools. Research themes are decided in advance by faculty mentors and may include topics in theoretical and/or computational physics, astrophysics, or biophysics; or data analysis related to experimental physics or biophysics, observational astronomy or cosmology, or numerical simulations of physical systems.

Enrollment by instructor permission only.

Normally students would have completed SC/PHYS 2020 3.0 and SC/PHYS 2030 3.0.
Students perform cutting-edge publication-worthy scientific research as part of an international team of faculty and student peers from other institutions in Canada and abroad. Students acquire hands-on experience in all phases of scientific inquiry, from the preparatory phases of gathering background information from the literature and creating a research plan, to the presentation of the project at a scientific conference. Collaboration is largely remote in nature, making use of virtual workspaces, code-sharing platforms, and other tools that are widely used in academia and industry.

Research activities involve both analytical and Python-based scientific computing methods applied to the theory, simulation, and/or data analysis of physical systems. These may include astroparticle physics; astrophysics; cosmology; high energy physics and phenomenology; gravitational physics; biophysics; atomic, molecular, and optical physics; and other topics in quantum physics. Specific research topics are decided in advance by faculty mentors on a year-to-year basis.

**Learning objective 1:** Students learn key research skills and methodologies, applicable to both academia and industry. These include: (i) reading and digesting primary scientific literature; (ii) oral presentation skills, both in formal and informal settings; (iii) experience working with international partners with different background and knowledge; (iv) use of critical reflection as a research tool to assess and track assumptions, results, and future steps; (v) bridging theoretical knowledge and computational methods to achieve a task; and (vi) synthesizing individual research outputs within a group to achieve a common goal.

**Learning objective 2:** Students gain hands-on knowledge and experience in Python-based scientific computing methods, applied to a long-term project in physics and related disciplines. Students write their own code and bolster their familiarity with existing packages such as numpy, scipy, and matplotlib. Students learn how to organize and collaborate on code-based projects using GitHub.
Course Design:

Indicate how the course design supports students in achieving the learning objectives. For example, in the absence of scheduled contact hours, what role does student-to-student and/or student-to-instructor communication play, and how is it encouraged?

Detail any aspects of the content, delivery, or learning goals that involve "face-to-face" communication, non-campus attendance or experiential education components.

Alternatively, explain how the course design encourages student engagement and supports student learning in the absence of substantial on-campus attendance.

Organizational structure (see fig. above): Research activities in course are united around a common scientific theme, with a cohort of students and mentors. Students are divided among project teams, each focused around specific questions and goals under the common theme. Students are assigned to teams based on their personal preference, as well as achieving a balanced international team. Each project team is led by one or more faculty mentors, plus one or more junior mentors (graduate students). Project topics are decided in advance by mentors.

(Multiple research themes can run concurrently during a single course. In this case, each theme would have its own separate cohort of students and mentors. Activities for each theme would be fully separate and run in parallel.)

Learning phase (F term): Students are given the background knowledge, technical skills, and strategies needed to perform scientific research.

- **Lectures**: Topical lectures are given by York faculty and mentors from partner universities, delivered in remote or hybrid format. Students are provided with introductory background knowledge needed for their projects, as well as the general context of their research within the field. Entire student cohort attends all lectures so everyone achieves a common background to understand the basics of all research projects, not just their own, to promote crosstalk between project teams.

  Lecture topics may vary year-by-year depending on research theme, are at the forefront of research, and may lie beyond the scope of existing York course offerings.

- **Python lessons**: Students complete a series of structured tutorials to bolster their knowledge in Python-based scientific computing. Each lesson is an interactive computing notebook for students to complete asynchronously on their own and includes small coding exercises for students to test their understanding. Lessons are publicly available at: [https://github.com/EXPLORE-for-students/python-tutorials](https://github.com/EXPLORE-for-students/python-tutorials)

- **Python group exercises**: Students from different countries work collaboratively on group exercises (approx. four during the course). Each exercise is a “classic” computing activity related to the research theme.
These are hands-on programming activities that build upon material presented in lectures. Students also develop their communication and collaboration skills by working with peers in different countries. Collaboration is done remotely using CoCalc (http://www.cocalc.com), an online platform where the group can create and run a single joint code simultaneously.

- **Mini-journal club:** Students read and present a scientific paper to their research team in an informal journal-club-style presentation (approx. 20 min in length). Each student chooses one paper from a list of papers compiled by faculty mentors and related to their research projects. Students meet with mentors one-on-one to answer questions or discuss their presentation. Students (i) gain experience reading and digesting scientific articles; (ii) improve communication skills by making an oral presentation and answering questions from other team members; and (iii) provide peer-teaching opportunity whereby students can teach their peers about a key topic for the research project.

**Research phase (W term):** Students gain course-focused Experiential Education by collaborating with their research teams to work on a topic at the forefront of knowledge. Each team involves approx. 3-10 students working with approx. 2-4 mentors (including at least one faculty and one junior mentor). Teams may work independently, or there may be inter-team crosstalk if needed (e.g., if one team is calculating an input to be used by another team’s analysis). Key activities of this phase include:

- **Group meetings:** Each week, students meet with their teams to discuss research progress. Typically, each student provides an update on their activities, answers questions, and discusses their next steps. Meetings are in remote or hybrid format. Students are assessed on participation, including attendance and actively participating in discussions (e.g., asking questions to peers).

The primary goal is for students to make progress on their projects, and thereby gain experience with the process of scientific research. Students also gain experience with communication as they explain their activities to their team via regular informal presentations.

- **Research journals:** Semi-weekly, the students complete a research journal exercise. The goal of the journal is to introduce critical reflection to student research, a key part of Experiential Education. Students are tasked with interpreting their results and coming up with next steps, not relying on supervisors to tell them what they did and what comes next.

In each journal, students must answer a series of prompts which are based on the “What? So what? Now what?” reflection model by Rolfe. Journal components include:

2. What does it mean? Interpret your results and judge whether you succeeded in your task.
Example research journals, as well as a research journal template, are provided here: https://github.com/EXPLORE-for-students/Research-notebooks

- Final workshop and presentations: Students participate in a scientific workshop organized by the faculty mentors. The workshop, given in remote or hybrid format, involves the entire cohort of students and mentors. Each student gives a formal presentation on their research (approx. 15 minutes/student), thereby sharing their findings with the entire cohort and practicing their oral communication skills in a formal setting. Each final presentation is crafted with input from other team members. Presentations are assessed based on a rubric.

The workshop also includes invited plenary speakers who are distinguished researchers involved in the research field. Students have the opportunity to ask questions to these guests, not just about science but about their career paths. An example workshop agenda can be found here: https://indico.cern.ch/event/1065328/

Mode of delivery: BLEN

**Instruction:**

1. Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.).

2. Number of department members currently competent to teach the course.

3. Instructor(s) likely to teach this course: S. Tulin and one of C. Bergevin, P. Hall, E. Hyde, M. Johnson, S. Rugheimer

4. Contact hours: 36 contact hours
   
   Fall term (17 hours):
   - Introductory lectures: 6 hours (both from York faculty and guest lecturers from other institutions)
   - Informal presentations: 2 hours
   - Research group meetings: 8 hours
   - One-on-one meetings with student: 1 hour

   Winter term (19 hours):
   - Research group meetings: 12 hours
   - Final conference lectures: 6 hours
   - One-on-one meetings with student: 1 hour

   Students are expected to engage in approx. 5 hours/week throughout the course on average.
Evaluation:

A detailed percentage breakdown of the basis of evaluation in the proposed course must be provided.

If the course is to be integrated, the additional requirements for graduate students are to be listed.

If the course is amenable to technologically mediated forms of delivery, please identify how the integrity of learning evaluation will be maintained. (e.g., will "on-site" examinations be required, etc.)

Assessment scheme:

- **10% Oral presentation:** Student gives an informal journal-club-style presentation on a scientific paper (approx. 20 min) on scientific paper related to research topic. Evaluation based on overall understanding of the topic, clarity of presentation, and fitting within time constraints.
- **10% Participation:** Student evaluated weekly, based on attendance and contributions to group meetings.
- **10% Group exercises:** Each group is given a common grade, based on their completion of the exercise. Each exercise is weighted equally.
- **40% Research journals:** Student completes approx. 6 journals, each weighted evenly. Evaluation based on successfully completing prompts.
- **30% Final presentation:** Student gives a formal presentation with slides at the final workshop event (approx. 15 min). Evaluation based on overall understanding of the topic, clarity of slides, clarity of oral communication, fitting within time constraints, and overall progress in their activities.

All assessments will utilize rubrics which will be provided to students ahead of time. While York students may be supervised in their projects by non-York faculty mentors, their assessment will be performed in conjunction with York faculty.

Bibliography:

A READING LIST MUST BE INCLUDED FOR ALL NEW COURSES

The Library has requested that the reading list contain complete bibliographical information, such as full name of author, title, year of publication, etc., and that you distinguish between required and suggested readings. A statement is required from the bibliographer responsible for the discipline to indicate whether resources are adequate to support the course.

Also please list any online resources.

If the course is to be integrated (graduate/undergraduate), a list of the additional readings to be required of graduate students must be included. If no additional readings are to be required, a rationale should be supplied.

LIBRARY SUPPORT STATEMENT MUST BE INCLUDED.

Course reading list is specially chosen by faculty on a year-by-year, project-by-project basis to provide key background material needed for each student in their research activities. Due to the cutting-edge nature of research, most reading material is selected from the scientific literature. Nearly all relevant articles are available for free or using York’s existing journal subscriptions.

The following databases are useful online resources for searching and accessing the scientific literature:

https://www.arxiv.org
https://inspirehep.net
https://ui.adsabs.harvard.edu/
Other Resources:
A statement regarding the adequacy of physical resources (equipment, space, etc.) must be appended. If other resources will be required to mount this course, please explain.

COURSES WILL NOT BE APPROVED UNLESS IT IS CLEAR THAT ADEQUATE RESOURCES ARE AVAILABLE TO SUPPORT IT.

Required resources:
Due to international nature of course, course will largely be in virtual format. Hybrid activities will convene in meeting rooms (e.g. PSE 258) due to the small number of York students (10-20). No equipment or classroom space is required.

Course Rationale:
The following points should be addressed in the rationale:

How the course contributes to the learning objectives of the program / degree.

The relationship of the proposed course to other existing offerings, particularly in terms of overlap in objectives and/or content. If inter-Faculty overlap exists, some indication of consultation with the Faculty affected should be given.

The expected enrolment in the course.

How the course contributes to the learning objectives of program/degree:

This course content aligns significantly with our Program Learning Outcomes (PLOs). References to these learning outcomes (see Appendix A) are given throughout.

The proposed course fosters undergraduate participation in scientific research. According to the Physics & Astronomy Dept. website (https://www.yorku.ca/science/physics/undergraduate/physics-and-astronomy/), important highlights for undergraduates include:

- "Students gain the ability to think critically and to analyze and solve complex problems, talents that are in high demand in both the private and public sectors."

- Students have “an abundance of opportunities to participate in world-class research projects led by York professors.”

The process of scientific research – making new discoveries at the frontier of knowledge – leads to new modes of thinking, new technologies, new medicines, and new understandings of nature from microscopic to astronomical scales.
Scientific research is also the perfect training ground for the next generation of critical-thinkers and problem-solvers. In research, outcomes and methodologies are not already known—unlike in the classroom—and must be reached through creative and quantitative exploration. Such skills are crucial for addressing the many challenges in our world. Nevertheless, there is a profound gap between classroom learning and the actual application of knowledge and methodology to solve novel problems. This course address that gap. (PLOs 3f, 3g, 3h, 3i)

There are other reasons for getting students involved in research. Giving students an opportunity “do science” – instead of just learning about science abstractly in the classroom – leads to greater engagement and retention (https://www.nytimes.com/2011/11/06/education/edlife/why-science-majors-change-their-mind-its-just-so-darn-hard.html). Also, the communication and collaboration skills gained from team-based efforts are key soft skills that are not emphasized in the classroom as often as individual performance. (PLOs 4a, 4b, 4c, 4d)

The proposed course has an international component, involving students and faculty from other countries. Fostering international engagement is a key university priority (https://www.yorku.ca/global-engagement/), reflecting the nature of global partnerships needed to achieve the world’s shared common goals (as well as York’s very diverse student body). Students learn to collaborate with peers from other countries, with different backgrounds, perspectives, and knowledge. Synthesizing diverse viewpoints can provide a superior end-product compared to any one individual effort. (PLOs 6d, 6e, 6f)

Relation to existing course offerings:

*PHYS 4310: Physics or Astronomy Project.* A faculty-supervised research endeavour, either experimental or theoretical, in physics or astronomy. Before enrolling, the student and faculty member must agree upon the project scope, background reading, milestones including student-faculty meeting schedule, and deliverables including final written report.

In comparison, the proposed course offers:
- Internationalization: Student collaborates with peers and/or faculty from different universities in other countries.
- Experiential learning and critical reflection are built in. Students gain experience not just doing research but thinking like a researcher.
- Enhanced opportunities for improving scientific communication skills (i.e., journal-club-style presentation, final workshop presentation, as well as weekly group meetings to team members).
- Structured Python tutorials to provide learning in scientific computing related to the research area.
- Peer-teaching opportunities. By working in teams, students can lead discussions and share expertise with each other.

*PHYS 2030: Computational Methods for Physicists and Engineers.* Programming strategies and techniques using a language such as Python are developed as a tool for numerical analysis, modeling, and computations in physics, astronomy, and engineering. Content: This course provides programming strategies and
techniques using a language such as Python are developed as a tool for numerical analysis, modeling, and computations in physics, astronomy, and engineering.

In comparison, the proposed course offers:
- A practical introduction to Python’s existing libraries for scientific computing, as opposed to the learning and application of specific numerical algorithms.
- Application of Python to longer, more open-ended problems (as opposed to short exercises appropriate for homework assignments).
- Collaborative programming groupwork with peers in different countries.

Expected enrollment: 10-20 students/year

Faculty and Department Approval for Cross-listings:
If the course is to be cross-listed with another department, this section needs to be signed by all parties. In some cases there may be more than two signatures required (i.e. Mathematics, Women’s Studies). In the majority of the cases either the Undergraduate Director or Chair of a unit approves the agreement to cross-list. All relevant signatures must be obtained prior to submission to the Faculty curriculum committee.

Dept: ____________________________
Signature (Authorizing cross-listing) Department __________ Date __________

Dept: ____________________________
Signature (Authorizing cross-listing) Department __________ Date __________

Dept: ____________________________
Signature (Authorizing cross-listing) Department __________ Date __________

Accessible format can be provided upon request.
Appendix A:

Physics and Astronomy Program Learning Outcomes.

Graduates of the PHAS Undergraduate Program will be able to...

1. **Depth and Breadth of Knowledge**
   a. Describe the foundational concepts of physics.
   b. Explain the scientific method and apply it to problems in physics and/or astrophysics.
   c. Recognize problems to which knowledge of physics may be productively applied.
   d. (Astronomy & Astrophysics streams) Outline our modern picture of the past, present and future of the Universe.

2. **Knowledge of Methodologies**
   a. Identify mathematical, computational, or experimental principles and techniques useful in solving a problem under study, as well as those not useful in a given case.
   b. Recognize special or limiting cases.
   c. Recognize problems that could benefit from mathematical modeling, and be familiar with modeling techniques.
   d. Evaluate the setup of an experiment using the basic precepts of good experimentation, including relevant use of controls.
   e. (Space Science stream) Exhibit understanding of methods used in the development, testing, deployment, and operation of spacecraft.

3. **Application of Knowledge**
   a. Apply mathematical principles and techniques to solve practical and theoretical problems in the physical sciences.
   b. Arrive at solutions without approximation where appropriate.
   c. Estimate order-of-magnitude or approximate solutions when appropriate.
   d. Apply existing software and create or adapt software as needed to solve mathematical and physical problems symbolically and to analyze and model data to formulate and test hypotheses.
   e. Use complex instrumentation to carry out experiments effectively.
   f. Formulate experimental hypotheses to test as part of solving a problem, based on experience with exploratory laboratory activities.
   g. Construct logical arguments to defend or be critical of a hypothesis or experiment.
   h. Competently search textbooks, manuals, databases, and other references for information, critically evaluate the reliability of sources, and synthesize consensus or pinpoint disagreements between disparate sources of information.
   i. Think laterally and manipulate ideas in seeking solutions to problems when necessary.

4. **Communication Skills**
   a. Report coherently on the results of experimental activities.
   b. Assimilate and record concepts transmitted orally or in writing.
   c. Synthesize and clearly communicate concepts to colleagues in writing and orally.
   d. Communicate knowledge effectively to the lay public.

5. **Awareness of Limits of Knowledge**
   a. Estimate uncertainties in measurements and propagate them in calculations.
   b. Understand and apply basic statistics, in particular to evaluate the statistical significance of measurements, to fit measurements with a model, and to estimate the goodness-of-fit of a model to a dataset.
   c. (Astronomy & Astrophysics streams) Outline gaps in our understanding of the past, present and future of the Universe.

6. **Autonomy and Professional Capacity**
   a. Learn how to use new instrumentation to carry out experiments effectively.
   b. Keep accurate and legible records in experimentation and computing.
c. Adhere to accepted standards of safety during experimentation.

d. Work both independently and collaboratively by demonstrating initiative, organizing effectively, and meeting deadlines.

e. Interact constructively with highly qualified personnel and the lay public.

f. Adhere to the highest ethical standards for both the practice and communication of science.
MEMORANDUM
York University Libraries

To: Matthew George, Undergraduate Program Director, Department of Physics and Astronomy

From: Minglu Wang, Research Data Management / Science Librarian, York University Libraries

Date: October 28, 2022

Subject: Library Statement of Support – PHYS 3600 – Experiential Learning Opportunity through Research and Exchange (EXPLORE)

Summary

York University Libraries (YUL) is well positioned to support the proposed course. Faculty and students can make use of an array of library resources and services to meet their research and learning needs. This statement highlights offerings related to the major themes of the course.

Collections

The Libraries’ collections echo the curricular and research priorities of students and faculty. Care is given to select materials that reflect new courses taught at York, as well as research and publishing trends. If later a more complete bibliography could be provided, our Collection Development and Analysis Department could search the bibliography against our library collection. Tailored purchasing profiles ensure new materials are regularly purchased on subjects such as theoretical and/or computational physics, astrophysics, biophysics, observational astronomy, and cosmology.

The Omni single-search interface provides students with access to a wide range of materials, including books, book chapters, scholarly articles, dissertations, streaming media, etc. Library users may also request items from partner libraries through Omni. A selection of electronic collections of particular interest are highlighted below. The A-Z list on the Libraries’ website provides a complete register of electronic offerings.

Subject Databases:

- INSPIRE
- arXiv.org
- NASA Astrophysics Data System
- Inspec
E-resource permalinks can be embedded in the course learning management system, ex. Canvas or eClass. Please consult the library's [Creating Permalinks for EResources Guide](#) for more information.

**Services**

**Library Instruction**

Librarians and archivists help students build research skills and digital fluencies through [workshops](#), [online research guides](#), and individual research assistance. Instructors can [arrange a research skills workshop](#) (or seminar) geared to a specific assignment, course, or competency.

**Research Guides of Interest:**

- [Physics Research Guide](#)
- [Astronomy Research Guide](#)
- [Experimental Physics with Data Analysis Research Guide](#)

**Research Help**

Online [research assistance](#) is available in both French and English via chat, text, and email. In addition, students and faculty can book [one-hour research consultations](#) with a specialist librarian. The Libraries also offer a virtual drop-in service hosted through Zoom for help in real-time.

**Accessibility Services**

Located on the first floor of the Scott Library (Keele Campus), [Library Accessibility Services](#) (LAS) provides alternative content formats, as well as adaptive technologies and spaces. With a referral, York University faculty and students can request transcription services or reserve an accessibility lab workstation.
Non-Major Modification Program Changes

1. Program:
   Biophysics Specialized Honours Program

2. Degree Designation: B.Sc.

3. Type of Modification: addition of new course (PHYS 4030 3.0) to list of upper-year PHYS courses options.

4. Effective Date: Fall 2023

5. State what the changes are (Example: increase / decrease to the number of major credits)

   The addition of SC\PHYS 4030 3.00 Advanced Computational Methods for Scientists and Engineers to the list of upper-year PHYS course options. The total number of required credits will remain the same.

6. Provide the rationale for the proposed changes that is rooted in the program learning outcomes.

   As part of the Specialized Honours Biophysics Program, students are required to select 9.0 credits from a list of upper-year physics courses which have been pre-selected as being particularly relatable to the broad area of biophysics in general.

   PHYS 4030 Advanced Computational Methods for Scientists and Engineers provides students with computational approaches to introduce, demonstrate, and reinforce advanced topics in physics. Topics include advanced data analysis and computational modeling techniques (e.g., signal processing, Monte Carlo simulations, numerical integration of ordinary and partial differential equations, etc.) as well as visualization strategies. Basic tenets and elements of "Data Science" and machine learning (e.g., Deep Learning) are introduced so that students gain exposure to, and an appreciation of, how large-scale computation is rapidly evolving and affecting a broad range of scientific methodologies.

   Such topics are broad enough to allow course directors and students to connect the knowledge gained to biophysical applications.

7. Provide an updated mapping of the program requirements to the program learning outcomes to illustrate how the proposed requirements will support the achievement of program learning objectives.

8. If relevant, summarize the consultation undertaken with relevant academic units, including commentary on the impact of the proposed changes on other programs. Provide individual statements from the relevant program(s) confirming consultation and their support.

   This is purely PHAS/BPHS issue. The upper-year Biology course option list is distinct.

May 11, 2017
9. Describe any resource implications and how they are being addressed (e.g., through a reallocation of existing resources). If new/additional resources are required, provide a statement from the relevant Dean(s)/Principal confirming resources will be in place to implement the changes.

SC\PHYS 4030 3.0 was first offered in Fall 2020, and is expected to be offered in subsequent years. An influx of Biophysics students is not expected to bring the total course enrollment > 20.

10. Provide a summary of how students currently enrolled in the program will be impacted.

This will have no impact on student currently enrolled. In fact, current biophysics students interested in PHYS 4030 have been given course waivers to include PHYS403 in the list of options.

11. Provide as an appendix a side-by-side comparison of the existing and proposed program requirements as they will appear in the Undergraduate or Graduate Calendar.

This is an interdisciplinary Specialized Honours program, offered by the Department of Physics and Astronomy, requiring coursework and practical experience in physics, biology, chemistry, mathematics and computer science. The focus of the program is on applying laws and methods of physics to understand biological processes.

The program core (73 credits) is defined as:

- \textbf{SC/BIOL 1000 3.00} and \textbf{SC/BIOL 1001 3.00}; \textbf{SC/BIOL 2020 3.00}; \textbf{SC/BIOL 2021 3.00}; \textbf{SC/BIOL 2040 3.00}; \textbf{SC/BIOL 2070 3.00};
- \textbf{SC/BPHS 2090 3.00}; \textbf{SC/BPHS 3090 3.00}; \textbf{SC/BPHS 4090 3.00};
- \textbf{SC/CHEM 1000 3.00}; \textbf{SC/CHEM 1001 3.00};
- \textbf{SC/MATH 1025 3.00}; \textbf{SC/MATH 2015 3.00}; \textbf{SC/MATH 2271 3.00};
- \textbf{SC/PHYS 1011 3.00} and \textbf{SC/PHYS 1012 3.00}; or one of \textbf{SC/PHYS 1010 6.00}, \textbf{SC/ISCI 1310 6.00}, or \textbf{SC/PHYS 1410 6.00} with a grade of C or higher,

This is an interdisciplinary Specialized Honours program, offered by the Department of Physics and Astronomy, requiring coursework and practical experience in physics, biology, chemistry, mathematics and computer science. The focus of the program is on applying laws and methods of physics to understand biological processes.

The program core (73 credits) is defined as:

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- \textbf{SC/BPHS 2090 3.00}; \textbf{SC/BPHS 3090 3.00}; \textbf{SC/BPHS 4090 3.00};
- \textbf{SC/CHEM 1000 3.00}; \textbf{SC/CHEM 1001 3.00};
- \textbf{SC/MATH 1025 3.00}; \textbf{SC/MATH 2015 3.00}; \textbf{SC/MATH 2271 3.00};
- \textbf{SC/PHYS 1011 3.00} and \textbf{SC/PHYS 1012 3.00}; or one of \textbf{SC/PHYS 1010 6.00}, \textbf{SC/ISCI 1310 6.00}, or \textbf{SC/PHYS 1410 6.00} with a grade of C or higher,
A. General education:

- non-science requirement: 12 credits;
- mathematics: SC/MATH 1013 3.00 and SC/MATH 1014 3.00;
- computer science: LE/EECS 1541 3.00;
- foundational science: satisfied within the major requirements.

B. Major requirements:

- the program core (73 credits)

Additional courses:

- at least nine credits from:
  - SC/PHYS 2040 3.00
  - SC/PHYS 3010 3.00
  - SC/PHYS 3020 3.00
  - SC/PHYS 3050 3.00
  - SC/PHYS 3090 3.00
  - SC/PHYS 3150 3.00
  - SC/PHYS 3220 3.00
  - SC/PHYS 3320 3.00
  - SC/PHYS 4010 3.00
  - SC/PHYS 4011 3.00
  - SC/PHYS 4020 3.00
  - SC/PHYS 4040 3.00
  - SC/PHYS 4050 3.00
  - SC/PHYS 4120 3.00;

- at least 15 credits from:
  - HH/KINE 2031 3.00
  - HH/KINE 3012 3.00
  - HH/KINE 4455 3.00
  - HH/KINE 4470 3.00
  - SC/Biol 2030 4.00
  - SC/Biol 3010 3.00
  - SC/Biol 3051 3.00
  - SC/Biol 3060 4.00
  - SC/Biol 3110 3.00
  - SC/Biol 3120 3.00
  - SC/Biol 3130 3.00
  - SC/Biol 3150 4.00
  - SC/Biol 3155 3.00
  - SC/Biol 4030 3.00

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- non-science requirement: 12 credits;
- mathematics: SC/MATH 1013 3.00 and SC/MATH 1014 3.00;
- computer science: LE/EECS 1541 3.00;
- foundational science: satisfied within the major requirements.

B. Major requirements:

- the program core (73 credits)

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  - SC/PHYS 3320 3.00
  - SC/PHYS 4010 3.00
  - SC/PHYS 4011 3.00
  - SC/PHYS 4020 3.00
  - SC/PHYS 4040 3.00
  - SC/PHYS 4050 3.00
  - SC/PHYS 4120 3.00;

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  - HH/KINE 3012 3.00
  - HH/KINE 4455 3.00
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  - SC/Biol 3110 3.00
  - SC/Biol 3120 3.00
  - SC/Biol 3130 3.00
  - SC/Biol 3150 4.00
  - SC/Biol 3155 3.00
  - SC/Biol 4030 3.00
C. Science breadth: satisfied by above requirements.

D. Upper level requirements: at least 42 credits at the 3000 or higher level, including at least 12 major credits at the 4000 level.

E. Additional elective credits, as required for an overall total of at least 120 credits.

F. Standing requirements: to graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.
# Changes to Existing Course

**Faculty:** Science  
**Department:** Science, Technology and Society  
**Date of Submission:** October 20, 2022  
**Course Number:** STS 2222  
**Effective Session:** 2023-2024  
**Course Title:** Exploring Gender in STEM

### Type of Change:

<table>
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<th>Change Type</th>
<th>Status</th>
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<tr>
<td>in Calendar description (max. 40 words or 200 characters)</td>
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<td>other (please specify):</td>
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</tbody>
</table>

### Change From:

STS 2222 is currently offered as LECT only

### To:

In addition to LECT, we would like to offer STS 2222 in alternative delivery modes in the F, W and SU semesters: ONLN, ONCA and BLEN
Rationale:

STS recently reopened its program in January of 2022. STS 2222 is a required course for both the major and minor degree programs. Different delivery modes of the course offer flexibility of teaching and learning in the STS degree program that will help support recruitment and retention.

Our desire to offer greater course flexibility aligns with York University’s current Academic Plan. For example, one of York’s six priority areas of action addresses 21st century learning where one objective is to, “offer a wider range of credentials and flexible delivery options, from in-person to virtual, to expand access to learning for diverse individuals at multiple stages of their lives and careers” (https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/)

The Faculty of Science’s Strategic Planning Mandate (2021-25) also encourages departments to, “optimize online and blended in-person/online courses and programs to diversify learning” (https://www.yorku.ca/science/about/strategic-plan/)

In addition, we believe it is important to offer multiple sections of our required courses to encourage participation from both international students and equity-seeking groups. We can do this by creating more “……virtual capacity for active and collaborative learning, so that students gain skills in working with others along with the joy of belonging to a learning community, wherever they are located.” (https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/)

This is especially important for STS 2222 which has been specifically designed to introduce students to EDI curriculum in STEM fields.

Due to the Pandemic, STS 2222 was re-designed to accommodate an online mode of instruction for 2020-21 and 2021-22. As such, there is already an existing framework for online curriculum delivery, assessments, and meeting course learning objectives remotely.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised ‘Course Design’ and ‘Method of Instruction’ information.

Course Design:

Indicate how the course design supports students in achieving the learning objectives. For example, in the absence of scheduled contact hours what role does student-to-student and/or student-to-instructor communication play, and how is it encouraged? Detail any aspects of the content, delivery, or learning goals that involve “face-to-face” communication, non-campus attendance or experiential education components.

Alternatively, explain how the course design encourages student engagement and supports student learning in the absence of substantial on-campus attendance.

STS courses in any format require engagement with text, visual media, and the objects and settings of science and technology. Learning outcomes for STS courses can be met in a range of formats with different combinations of online and in-person components. The ONLN, ONCA and BLEN versions of STS 2222 will preserve the nature of the face-to-face course by offering students equivalent opportunities to examine and reflect on science and technology through recorded lecture modules and experiential exercises.

ONLN and ONCA versions of STS 2222 will use eClass to provide readings, lecture recordings, Zoom question-and-answer periods, online exercises, and videos.

In BLEN, readings, videos and lecture recordings will be available online. In-person components will consist of facilitated discussion and experiential exercises.
**Instruction:**

1. Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.).
2. Number of department members currently competent to teach the course.
3. Instructor(s) likely to teach the course in the coming year.
4. An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved, in order to indicate whether an effective length of term is being maintained OR in the absence of scheduled contact hours a detailed breakdown of the estimated time students are likely to spend engaged in learning activities required by the course.

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1. 1-2 sections every year
2. Conor Douglas, James Elwick, Ernst Hamm, Jill Lazenby, Dov Lungu, Hélène Mialet, Daniela Monaldi, and Vera Pavri are competent to teach this course both online and in-person.
3. Daniela Monaldi is likely to teach the course in the coming year.
4. In the existing LECT format STS 2222 has a total of 36 contact hours as follows:
   - In person lectures and discussion: 3 hours/week x 12 weeks = 36 hours

   **ONLN and ONCA versions of this course will feature 36 learning hours as follows:**
   - Online asynchronous lecture recordings and exercises: 3 hours/week x 12 weeks = 36 hours

   **BLEN versions of this course will feature 36 learning hours as follows:**
   - Online lecture recordings and/or video material and activities = 1.5 hours/week x 12 weeks = 18 hours
   - Synchronous in-person discussion session on lectures and activities = 1.5 hours/week x 12 weeks = 18 hours.
# Changes to Existing Course

**Faculty:** Science  
**Department:** Science, Technology and Society  
**Date of Submission:** November 7, 2022  
**Course Number:** STS 2010  
**Effective Session:** 2023-2024  
**Course Title:** History of Modern Science

**Type of Change:**
- [ ] in pre-requisite(s)/co-requisite(s)
- [ ] in course number/level
- [ ] in credit value
- [ ] in title (max. 40 characters for short title)
- [x] in course format/mode of delivery *
- [ ] in cross-listing
- [ ] in degree credit exclusion(s)
- [ ] regularize course (from Special Topics)
- [ ] retire/expire course
- [ ] other (please specify):

**Change From:**
STS 2010 is currently offered as LECT only

**To:**
In addition to LECT, we would like to offer alternative delivery modes in STS 2010 in the F, W and SU semesters: ONLN, ONCA and BLEN.
Rationale:

STS recently reopened its program in January of 2022. STS 2010 is a required course for both the major and minor degree programs. Different delivery modes of the course offer flexibility of teaching and learning in the STS degree program that will help support recruitment and retention.

Our desire to offer greater course flexibility aligns with York University’s current Academic Plan. For example, one of York’s six priority areas of action addresses 21st century learning where one objective is to, “offer a wider range of credentials and flexible delivery options, from in-person to virtual, to expand access to learning for diverse individuals at multiple stages of their lives and careers” (https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/)

The Faculty of Science’s Strategic Planning Mandate (2021-25) also encourages departments to, “optimize online and blended in-person/online courses and programs to diversify learning” (https://www.yorku.ca/science/about/strategic-plan/)

In addition, we believe it is important to offer multiple sections of our required courses to encourage participation from both international students and equity-seeking groups. We can do this by creating more “……virtual capacity for active and collaborative learning, so that students gain skills in working with others along with the joy of belonging to a learning community, wherever they are located.” (https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/)

Due to the Pandemic, this course was re-designed to accommodate an online mode of instruction for 2020-21 and 2021-22. As such, there is already an existing framework for online curriculum delivery, assessments, and meeting course learning objectives remotely.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised ‘Course Design’ and ‘Method of Instruction’ information.

Course Design:

Indicate how the course design supports students in achieving the learning objectives. For example, in the absence of scheduled contact hours what role does student-to-student and/or student-to-instructor communication play, and how is it encouraged? Detail any aspects of the course, delivery, or learning goals that involve "face-to-face" communication, non-campus attendance or experiential education components.

Alternatively, explain how the course design encourages student engagement and supports student learning in the absence of substantial on-campus attendance.

STS courses in any format require engagement with text, visual media, and the objects and settings of science and technology. Learning outcomes for STS courses can be met in a range of formats with different combinations of online and in-person components. The ONLN, ONCA and BLEN versions of STS 2010 will preserve the nature of the face-to-face course by offering students equivalent opportunities to examine and reflect on science and technology through recorded lecture modules and experiential exercises.

ONLN and ONCA versions of STS 2010 will use eClass to provide readings, lecture recordings, Zoom question-and-answer periods, online research exercises, and videos.

In BLEN, readings, videos and lecture recordings will be available online. In-person components will consist of facilitated discussion and experiential exercises.
Instruction:
1. Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.).
2. Number of department members currently competent to teach the course.
3. Instructor(s) likely to teach the course in the coming year.
4. An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved, in order to indicate whether an effective length of term is being maintained OR in the absence of scheduled contact hours a detailed breakdown of the estimated time students are likely to spend engaged in learning activities required by the course.

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<td>2 sections every year</td>
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<tr>
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</tr>
<tr>
<td>3.</td>
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</tr>
<tr>
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</table>
Changes to Existing Course

Faculty: Science

Department: Science, Technology and Society

Date of Submission: November 7, 2022

Course Number: STS 3561 3.0

Effective Session: 2023-2024

Course Title: From the Abacus to Artificial Intelligence: How the Computer Came to Be

Type of Change:

- in pre-requisite(s)/co-requisite(s)
- in course number/level
- in credit value
- in title (max. 40 characters for short title) **X**
- in Calendar description (max. 40 words or 200 characters)
- other (please specify):

Change From:

STS 3561 is currently offered as LECT only

To:

In addition to LECT, we would like to offer alternative delivery modes in the F, W and SU semesters: ONLN, ONCA and BLEN
Rationale: STS recently reopened its program in January of 2022. STS 3561 is a popular course option that fulfills requirements for both the STS major, and the Technology, Innovation and Society option in the STS minor degree program. Different delivery modes of the course offer flexibility of teaching and learning in the STS degree program that will help support recruitment and retention.

Our desire to offer greater course flexibility aligns with York University’s current Academic Plan. For example, one of York’s six priority areas of action addresses 21st century learning where one objective is to, “offer a wider range of credentials and flexible delivery options, from in-person to virtual, to expand access to learning for diverse individuals at multiple stages of their lives and careers” (https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/)

The Faculty of Science’s Strategic Planning Mandate (2021-25) also encourages departments to, “optimize online and blended in-person/online courses and programs to diversify learning” (https://www.yorku.ca/science/about/strategic-plan/)

In addition, we believe it is important to offer multiple sections of our courses to encourage participation from both international students and equity-seeking groups. We can do this by creating more “…..virtual capacity for active and collaborative learning, so that students gain skills in working with others along with the joy of belonging to a learning community, wherever they are located.” (https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/)

Due to the Pandemic, STS 3561 was re-designed to accommodate an online mode of instruction for 2020-21 and 2021-22. As such, there is already an existing framework for online curriculum delivery, assessments, and meeting course learning objectives remotely.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised “Course Design” and “Method of Instruction” information.

Course Design:

Indicate how the course design supports students in achieving the learning objectives. For example, in the absence of scheduled contact hours what role does student-to-student and/or student-to-instructor communication play, and how is it encouraged? Detail any aspects of the content, delivery, or learning goals that involve "face-to-face" communication, non-campus attendance or experiential education components.

Alternatively, explain how the course design encourages student engagement and supports student learning in the absence of substantial on-campus attendance.

STS courses in any format require engagement with text, visual media, and the objects and settings of science and technology. Learning outcomes for STS courses can be met in a range of formats with different combinations of online and in-person components. The ONLN, ONCA and BLEN versions of STS 3561 will preserve the nature of the face-to-face course by offering students equivalent opportunities to examine and reflect on science and technology through recorded lecture modules and experiential exercises.

ONLN and ONCA versions of STS 3561 will use eClass to provide readings, lecture recordings, Zoom question-and-answer periods, online research exercises, and videos of science in action.

In BLEN, readings, videos and lecture recordings will be available online. In-person components will consist of facilitated discussion and experiential exercises.
1. Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.).

2. Number of department members currently competent to teach the course.

3. Instructor(s) likely to teach the course in the coming year.

4. An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved, in order to indicate whether an effective length of term is being maintained OR in the absence of scheduled contact hours a detailed breakdown of the estimated time students are likely to spend engaged in learning activities required by the course.

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1. 1 section every year

2. Dov Lungu and Vera Pavri are competent to teach this course both online and in-person.

3. Roberta Buiani (CUPE) is likely to teach the course in the coming year.

4. In the existing LECT format STS 3561 has a total of 36 contact hours as follows:
   - In person lectures and exercises: 3 hours/week x 12 weeks = 36 hours

   ONLN and ONCA versions of this course will feature 36 learning hours as follows:
   - Online asynchronous lecture recordings: 3 hours/week x 12 weeks = 36 hours

   BLEN versions of this course will feature 36 learning hours as follows:
   - Online lecture recordings and/or video material and activities = 1.5 hours/week x 12 weeks = 18 hours
   - Synchronous in-person discussion session on lectures and activities = 1.5 hours/week x 12 weeks = 18 hours.
## Changes to Existing Course

**Faculty:** Science  
**Department:** Science, Technology and Society  
**Date of Submission:** November 7, 2022  
**Course Number:** STS 2210  
**Effective Session:** 2023-2024  
**Course Title:** Technology in the Modern World

### Type of Change:

- [ ] in pre-requisite(s)/co-requisite(s)  
- [ ] in course number/level  
- [ ] in credit value  
- [ ] in title (max. 40 characters for short title)  
- [x] in course format/mode of delivery *  
- [ ] in cross-listing  
- [ ] in degree credit exclusion(s)  
- [ ] regularize course (from Special Topics)  
- [ ] retire/expire course  
- [ ] other (please specify):

### Change From:

STS 2210 is currently offered as LECT only

### To:

In addition to LECT, we would like to offer alternative delivery modes for STS 2210 in the F, W and SU semesters: ONLN, ONCA and BLEN.
Rationale: STS recently reopened its program in January of 2022. STS 2210 is a required course for both the major and minor degree programs. Different delivery modes of the course offer flexibility of teaching and learning in the STS degree program that will help support recruitment and retention.

Our desire to offer greater course flexibility aligns with York University’s current Academic Plan. For example, one of York’s six priority areas of action addresses 21st century learning where one objective is to, “offer a wider range of credentials and flexible delivery options, from in-person to virtual, to expand access to learning for diverse individuals at multiple stages of their lives and careers” (https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/)

The Faculty of Science’s Strategic Planning Mandate (2021-25) also encourages departments to, “optimize online and blended in-person/online courses and programs to diversify learning” (https://www.yorku.ca/science/about/strategic-plan/)

In addition, we believe it is important to offer multiple sections of our required courses to encourage participation from both international students and equity-seeking groups. We can do this by creating more “……virtual capacity for active and collaborative learning, so that students gain skills in working with others along with the joy of belonging to a learning community, wherever they are located.” (https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/)

Due to the Pandemic, this course was re-designed to accommodate an online mode of instruction for 2020-21 and 2021-22. As such, there is already an existing framework for online curriculum delivery, assessments, and meeting course learning objectives remotely.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course.

Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised ‘Course Design’ and ‘Method of Instruction” information.

Course Design:
Indicate how the course design supports students in achieving the learning objectives. For example, in the absence of scheduled contact hours what role does student-to-student and/or student-to-instructor communication play, and how is it encouraged? Detail any aspects of the content, delivery, or learning goals that involve “face-to-face” communication, non-campus attendance or experiential education components.

Alternatively, explain how the course design encourages student engagement and supports student learning in the absence of substantial on-campus attendance.

STS courses in any format require engagement with text, visual media, and the objects and settings of science and technology. Learning outcomes for STS courses can be met in a range of formats with different combinations of online and in-person components. The ONLN, ONCA and BLEN versions of STS 2210 will preserve the nature of the face-to-face course by offering students equivalent opportunities to examine and reflect on science and technology through recorded lecture modules and experiential exercises.

ONLN and ONCA versions of STS 2210 will use eClass to provide readings, lecture recordings, Zoom question-and-answer periods, online exercises, and videos.

In BLEN, readings, videos and lecture recordings will be available online. In-person components will consist of facilitated discussion and experiential exercises.
**Instruction:**

1. Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.).
2. Number of department members currently competent to teach the course.
3. Instructor(s) likely to teach the course in the coming year.
4. An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved, in order to indicate whether an effective length of term is being maintained OR in the absence of scheduled contact hours a detailed breakdown of the estimated time students are likely to spend engaged in learning activities required by the course.

1. 2 sections every year
2. Conor Douglas, James Elwick, Ernst Hamm, Jill Lazenby, Dov Lungu, Hélène Mialet, Daniela Monaldi, and Vera Pavri are competent to teach this course both online and in-person.
3. Hélène Mialet and Daniela Monaldi are likely to teach the course in the coming year.
4. In the existing LECT format STS 2210 has a total of 36 contact hours as follows:
   - In person lectures: 3 hours/week x 12 weeks = 24 hours

   ONLN and ONCA versions of this course will feature 36 learning hours as follows:
   - Online asynchronous lecture recordings: 3 hours/week x 12 weeks = 36 hours

   BLEN versions of this course will feature 36 learning hours as follows:
   - Online lecture recordings and/or video material and activities = 1.5 hours/week x 12 weeks = 18 hours
   - Synchronous in-person discussion session on lectures and activities = 1.5 hours/week x 12 weeks = 18 hours.
# Changes to Existing Course

**Faculty:** Science  
**Department:** Science, Technology and Society  
**Date of Submission:** November 7, 2022  
**Course Number:** STS 2411  
**Effective Session:** 2023-2024  
**Course Title:** Exploring Science, Technology and Society  

## Type of Change:

<table>
<thead>
<tr>
<th>in pre-requisite(s)/co-requisite(s)</th>
<th>in cross-listing</th>
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<tbody>
<tr>
<td>in course number/level</td>
<td>in degree credit exclusion(s)</td>
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<td>in credit value</td>
<td>regularize course (from Special Topics)</td>
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<td>in title (max. 40 characters for short title)</td>
<td>in course format/mode of delivery *</td>
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<tr>
<td>in Calendar description (max. 40 words or 200 characters)</td>
<td>retire/expire course</td>
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<tr>
<td>other (please specify):</td>
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</tbody>
</table>

## Change From:

STS 2411 is currently offered as LECT only

## To:

In addition to LECT, we would like to offer STS 2411 in alternative delivery modes in the F, W and SU semesters: ONLN, ONCA and BLEN
**Rationale:**

STS recently reopened its program in January of 2022. STS 2411 is a required course for both the major and minor degree programs. Different delivery modes of the course offer flexibility of teaching and learning in the STS degree program that will help support recruitment and retention.

Our desire to offer greater course flexibility aligns with York University’s current Academic Plan. For example, one of York’s six priority areas of action addresses 21st century learning where one objective is to, “offer a wider range of credentials and flexible delivery options, from in-person to virtual, to expand access to learning for diverse individuals at multiple stages of their lives and careers” ([https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/](https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/))

The Faculty of Science’s Strategic Planning Mandate (2021-25) also encourages departments to, “optimize online and blended in-person/online courses and programs to diversify learning” ([https://www.yorku.ca/science/about/strategic-plan/](https://www.yorku.ca/science/about/strategic-plan/))

In addition, we believe it is important to offer multiple sections of our required courses to encourage participation from both international students and equity-seeking groups. We can do this by creating more “…..virtual capacity for active and collaborative learning, so that students gain skills in working with others along with the joy of belonging to a learning community, wherever they are located.” ([https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/](https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/))

Due to the Pandemic, STS 2411 was re-designed to accommodate an online mode of instruction for 2020-21 and 2021-22. As such, there is already an existing framework for online curriculum delivery, assessments, and meeting course learning objectives remotely.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised “Course Design” and “Method of Instruction” information.

**Course Design:**

Indicate how the course design supports students in achieving the learning objectives. For example, in the absence of scheduled contact hours what role does student-to-student and/or student-to-instructor communication play, and how is it encouraged?

Detail any aspects of the content, delivery, or learning goals that involve “face-to-face” communication, non-campus attendance or experiential education components.

Alternatively, explain how the course design encourages student engagement and supports student learning in the absence of substantial on-campus attendance.

STS courses in any format require engagement with text, visual media, and the objects and settings of science and technology. Learning outcomes for STS courses can be met in a range of formats with different combinations of online and in-person components. The ONLN, ONCA and BLEN versions of STS 2411 will preserve the nature of the face-to-face course by offering students equivalent opportunities to examine and reflect on science and technology through recorded lecture modules and experiential exercises.

ONLN and ONCA versions of STS 2411 will use eClass to provide readings, lecture recordings, Zoom question-and-answer periods, online research exercises, and videos.

In BLEN, readings, videos and lecture recordings will be available online. In-person components will consist of facilitated discussion and experiential exercises.
Instructions:

1. Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.).
2. Number of department members currently competent to teach the course.
3. Instructor(s) likely to teach the course in the coming year.
4. An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved, in order to indicate whether an effective length of term is being maintained or in the absence of scheduled contact hours a detailed breakdown of the estimated time students are likely to spend engaged in learning activities required by the course.

1. 1 section every year

2. Conor Douglas, James Elwick, Ernst Hamm, Jill Lazenby, Dov Lungu, Hélène Mialet, Daniela Monaldi, and Vera Pavri are competent to teach this course both online and in-person.

3. James Elwick is likely to teach the course in the coming year.

4. In the existing LECT format STS 2411 has a total of 36 contact hours as follows:
   - In person lectures and activities: 3 hours/week x 12 weeks = 36 hours

ONLN and ONCA versions of this course will feature 36 learning hours as follows:
   - Online asynchronous lecture recordings, videos and activities: 3 hours/week x 12 weeks = 36 hours

BLEN versions of this course will feature 36 learning hours as follows:
   - Online lecture recordings and/or video material and activities = 1.5 hours/week x 12 weeks = 18 hours
   - Synchronous in-person discussion session on lectures and activities = 1.5 hours/week x 12 weeks = 18 hours.
Changes to Existing Course

Faculty: Science

Department: Science, Technology and Society

Date of Submission: November 7, 2022

Course Number: STS 2333 3.0

Effective Session: 2023-2024

Course Title: Science, Technology and Racial Social Justice

Type of Change:

- in pre-requisite(s)/co-requisite(s)
- in course number/level
- in credit value
- in title (max. 40 characters for short title)
- in Calendar description (max. 40 words or 200 characters)
- in cross-listing
- in degree credit exclusion(s)
- regularize course (from Special Topics)
- in course format/mode of delivery *
- retire/expire course
- other (please specify):

Change From:

STS 2333 is currently scheduled to be offered as LECT only

To:

In addition to LECT, we would like to offer STS 2333 in alternative delivery modes in: ONLN, ONCA and BLEN
**Rationale:**

STS recently reopened its program in January of 2022. STS 2333 is a required course for both the major and minor degree programs. Different delivery modes of the course offer flexibility of teaching and learning in the STS degree program that will help support recruitment and retention.

Our desire to offer greater course flexibility aligns with York University’s current Academic Plan. For example, one of York’s six priority areas of action addresses 21st century learning where one objective is to, “offer a wider range of credentials and flexible delivery options, from in-person to virtual, to expand access to learning for diverse individuals at multiple stages of their lives and careers” ([https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/](https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/)).

The Faculty of Science’s Strategic Planning Mandate (2021-25) also encourages departments to, “optimize online and blended in-person/online courses and programs to diversify learning” ([https://www.yorku.ca/science/about/strategic-plan/](https://www.yorku.ca/science/about/strategic-plan/)).

In addition, we believe it is important to offer multiple sections of our required courses to encourage participation from both international students and equity-seeking groups. We can do this by creating more “…..virtual capacity for active and collaborative learning, so that students gain skills in working with others along with the joy of belonging to a learning community, wherever they are located.” ([https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/](https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/)). This is especially important for STS 2333 which has been specifically designed to introduce students to EDI curriculum in STEM fields.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

*Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised “Course Design” and “Method of Instruction” information.*

**Course Design:**

*Indicate how the course design supports students in achieving the learning objectives. For example, in the absence of scheduled contact hours what role does student-to-student and/or student-to-instructor communication play, and how is it encouraged? Detail any aspects of the content, delivery, or learning goals that involve “face-to-face” communication, non-campus attendance or experiential education components.

Alternatively, explain how the course design encourages student engagement and supports student learning in the absence of substantial on-campus attendance.*

STS courses in any format require engagement with text, visual media, and the objects and settings of science and technology. Learning outcomes for STS courses can be met in a range of formats with different combinations of online and in-person components. The ONLN, ONCA and BLEN versions of STS 2333 will preserve the nature of the face-to-face course by offering students equivalent opportunities to examine and reflect on science and technology through recorded lecture modules and experiential exercises.

ONLN and ONCA versions of STS 2333 will use eClass to provide readings, lecture recordings, Zoom question-and-answer periods, online exercises, and videos.

In BLEN, readings, videos and lecture recordings will be available online. In-person components will consist of facilitated discussion and experiential exercises.
Instruction:
1. Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.).
2. Number of department members currently competent to teach the course.
3. Instructor(s) likely to teach the course in the coming year.
4. An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved, in order to indicate whether an effective length of term is being maintained OR in the absence of scheduled contact hours a detailed breakdown of the estimated time students are likely to spend engaged in learning activities required by the course.

1. 2 sections every year
2. Conor Douglas, James Elwick, Ernst Hamm, Jill Lazenby, Dov Lungu, Hélène Mialet, Daniela Monaldi, and Vera Pavri are competent to teach this course both online and in-person.
3. Vera Pavri is likely to teach the course in the coming year.
4. In the existing LECT format STS 2333 has a total of 36 contact hours as follows:
   - In person lectures 3 hours/week x 12 weeks = 36 hours
ONLN and ONCA versions of this course will feature 36 learning hours as follows:
   - Online asynchronous lecture recordings and activities: 3 hours/week x 12 weeks = 36 hours
BLEN versions of this course will feature 36 learning hours as follows:
   - Online lecture recordings and/or video material and activities = 1.5 hours/week x 12 weeks = 18 hours
   - Synchronous in-person discussion session on lectures and activities = 1.5 hours/week x 12 weeks = 18 hours.
### Changes to Existing Course

**Faculty:** Science  
**Department:** Science, Technology and Society  
**Date of Submission:** November 7, 2022  
**Course Number:** STS 3730 3.0  
**Effective Session:** 2023-2024  
**Course Title:** Science, Technology and Modern Warfare

**Type of Change:**
- [ ] in pre-requisite(s)/co-requisite(s)  
- [ ] in course number/level  
- [ ] in credit value  
- [ ] in title (max. 40 characters for short title)  
- [x] in course format/mode of delivery *  
- [ ] in cross-listing  
- [ ] in degree credit exclusion(s)  
- [ ] regularize course (from Special Topics)  
- [ ] retire/expire course  
- [ ] other (please specify):

**Change From:** STS 3730 is currently offered as LECT only  
**To:** In addition to LECT, we would like to offer alternative delivery modes for STS 3730 in the F, W and SU semesters: ONLN, ONCA and BLEN
Rationale:

ST3 recently reopened its program in January of 2022. ST3 3730 is a popular course, and contributes to degree credits in the Technology, Innovation and Society option in the ST3 minor program. Different delivery modes of the course offer flexibility of teaching and learning in the ST3 degree program that will help support recruitment and retention.

Our desire to offer greater course flexibility aligns with York University’s current Academic Plan. For example, one of York’s six priority areas of action addresses 21st century learning where one objective is to, “offer a wider range of credentials and flexible delivery options, from in-person to virtual, to expand access to learning for diverse individuals at multiple stages of their lives and careers” (https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/)

The Faculty of Science’s Strategic Planning Mandate (2021-25) also encourages departments to, “optimize online and blended in-person/online courses and programs to diversify learning” (https://www.yorku.ca/science/about/strategic-plan/)

In addition, we believe it is important to offer multiple sections of our required courses to encourage participation from both international students and equity-seeking groups. can do this by creating more “…..virtual capacity for active and collaborative learning, so that students gain skills in working with others along with the joy of belonging to a learning community, wherever they are located.” (https://yfile.news.yorku.ca/2020/06/28/york-university-launches-new-academic-plan-for-2020-to-2025/) 

Due to the Pandemic, ST3 3730 was re-designed to accommodate an online mode of instruction for 2020-21 and 2021-22. As such, there is already an existing framework for online curriculum delivery, assessments, and meeting course learning objectives remotely.

Note: Course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised ‘Course Design’ and ‘Method of Instruction’ information.

Course Design:

Indicate how the course design supports students in achieving the learning objectives. For example, in the absence of scheduled contact hours what role does student-to-student and/or student-to-instructor communication play, and how is it encouraged? Detail any aspects of the content, delivery, or learning goals that involve "face-to-face" communication, non-campus attendance or experiential education components.

Alternatively, explain how the course design encourages student engagement and supports student learning in the absence of substantial on-campus attendance.

STS courses in any format require engagement with text, visual media, and the objects and settings of science and technology. Learning outcomes for STS courses can be met in a range of formats with different combinations of online and in-person components. The ONLN, ONCA and BLEN versions of ST3 3730 will preserve the nature of the face-to-face course by offering students equivalent opportunities to examine and reflect on science and technology through recorded lecture modules and experiential exercises.

ONLN and ONCA versions of ST3 3730 will use eClass to provide readings, lecture recordings, Zoom question-and-answer periods, online research exercises, and videos of science in action.

In BLEN, readings, videos and lecture recordings will be available online. In-person components will consist of facilitated discussion and experiential exercises.
**Instruction:**

1. Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.).
2. Number of department members currently competent to teach the course.
3. Instructor(s) likely to teach the course in the coming year.
4. An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved, in order to indicate whether an effective length of term is being maintained or in the absence of scheduled contact hours a detailed breakdown of the estimated time students are likely to spend engaged in learning activities required by the course.

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<tr>
<td>1.</td>
<td>1 section every year</td>
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<tr>
<td>2.</td>
<td>Dov Lungu and Vera Pavri are competent to teach this course both online and in-person.</td>
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<tr>
<td>3.</td>
<td>Ian Slater (CUPE) is likely to teach the course in the coming year.</td>
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<td>4.</td>
<td>In the existing LECT format STS 3730 has a total of 36 contact hours as follows:</td>
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<tr>
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<td>• In person lectures: 3 hours/week x 12 weeks = 36 hours</td>
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<td>ONLN and ONCA versions of this course will feature 36 learning hours as follows:</td>
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<tr>
<td></td>
<td>• Online asynchronous lecture recordings and video: 3 hours/week x 12 weeks = 36 hours</td>
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<td>BLEN versions of this course will feature 36 learning hours as follows:</td>
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<td>• Synchronous in-person discussion session on lectures and activities = 1.5 hours/week x 12 weeks = 18 hours.</td>
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Changes to Existing Course

Faculty: Science

Department: Science, Technology and Society

Date of Submission: November 7, 2022

Course Number: STS 3760 3.0

Effective Session: 2023-2024

Course Title: Nature, Knowledge and New Worlds, 1500-1800

Type of Change:

☐ in pre-requisite(s)/co-requisite(s)  ☑ in course number/level
☐ in credit value  ☐ in degree credit exclusion(s)
☒ in title (max. 40 characters for short title)  ☐ regularize course (from Special Topics)
☒ in Calendar description (max. 40 words or 200 characters)  ☐ in course format/mode of delivery *
☐ other (please specify):

Change From:

Nature, Knowledge and New Worlds, 1500-1800

An in-depth examination of the cultural, social, technological and intellectual context of a formative period in the history of modern science. Course credit exclusions: AP/HUMA 3760 6.00 (prior to Winter 2014), SC/STS 3760 6.00.

To:

The Scientific Revolution: Nature, Knowledge and New Worlds

An in-depth examination of the cultural, social, technological and intellectual context of the formative period in the history of modern science between 1500 and 1800. Course credit exclusions: AP/HUMA 3760 6.00 (prior to Winter 2014), SC/STS 3760 6.00. AP/HIST 2250 3.00
Rationale:

**Title change:**
The timeframe indicated in the original title, 1500-1800, has not been clearly recognizable to students as the period known as “The Scientific Revolution.” We think that the new name makes the course content more explicit to students and will encourage enrolment, especially given that our history of modern science courses often have robust enrolments.

**Change in Calendar Description:**
The time frame 1500-1800 has been added to the calendar description in order to make it clear to students the period of history that will be covered in the course.

**Change in Course Credit Exclusions:**
SC/STS 3760 3.0 is listed as a CCE for AP/HIST 2250 3.00. Therefore AP/HIST 2250 3.0 needs to be added as a course credit exclusion for STS 3760.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised ‘Course Design’ and ‘Method of Instruction’ information.
# Changes to Existing Course

**Faculty:** Science  
**Department:** Science, Technology and Society  
**Date of Submission:** October 20, 2022  
**Course Number:** STS 4090 3.0  
**Effective Session:** 2023-2024  
**Course Title:** Science in the Wild: Laboratory Studies and Ethnography

**Type of Change:**
- [ ] in pre-requisite(s)/co-requisite(s)  
- [ ] in course number/level  
- [ ] in credit value  
- [x] in title (max. 40 characters for short title)  
- [ ] in Calendar description (max. 40 words or 200 characters)  
- [ ] other (please specify):

**Change From:** Science in the Wild: Laboratory Studies and Ethnography  
**To:** What Do Scientists Do?: Laboratory Studies and Ethnography
Rationale: STS Faculty have reported that some students interpret “Science in the Wild” literally, as referring to biology and animal studies, rather than ethnography of science in the laboratory and field. A name change will clarify the topic of the course.

Note: For course proposals involving cross-listings, integrations and degree credit exclusions, approval from all of the relevant Faculties/department is required.

Note: Since one change (such as a change in year level or credit value) may result in several other changes (e.g., to the course description, evaluation, instruction, bibliography, etc.), please submit as many details as possible. If there are several changes, please feel free to use a New Course Proposal Form in order to ensure that all the required information is included.

* Note: If there is a technology component to the course, a statement is required from ATS indicating whether resources are adequate to support the course. Courses converted from face-to-face to an on-line delivery mode should follow the instructions provided on page 4 of the New Course Proposal Form to provide revised ‘Course Design’ and ‘Method of Instruction’ information.
FACULTY OF SCIENCE

Graduate Curriculum Committee

Meeting
October 2022
eVote

Agenda

1. New Course Proposal
   MATH 6940 3.0 Perturbation Methods
New Graduate Course Proposal Form
FACULTY OF SCIENCE

The following information is required for all new course proposals. Provide evidence of consultation, where appropriate. To facilitate the review/approval process, please use the headings below (and omit the italicized explanations below each heading).

All new course proposals must include a library statement.

1. **Graduate Program**: Mathematics and Statistics
2. **Responsible Unit**: Department of Mathematics & Statistics, Faculty of Science
3. **Subject Code (Rubric) and Course Number**: MATH 6940
4. **Credit Value**: 3.0
5. **Long Course Title**: Perturbation Methods
6. **Short Course Title**: Perturbation Methods
7. **Effective Term/Calendar Year**: FW2023
8. **Language of Instruction**: English
9. **Mode of Delivery**: In-Person

10. **Calendar (Short) Course Description**: This course introduces perturbative methods as techniques for finding approximate solutions to mathematical problems. The course begins with approximating roots to polynomials before exploring applications in linear algebra, integrals, and differential equations. This course is integrated with MATH 4940.

Prerequisites: Students should have familiarity with calculus, linear algebra, and differential equations.

11. **Expanded Course Description**: This course introduces students to the concept of formal perturbation expansions as a means of approximation. Beginning with polynomial roots students will learn the
concept of regular and singular expansions and discuss the concepts of order and term balancing. Students will explore perturbative solutions in linear algebra to decouple nearly degenerate eigenvalues. They will explore a variety of techniques for asymptotically approximating integrals including Laplace’s Method, the method of steepest descent, and successive integration by parts. The concept of matched asymptotic expansions will be introduced through solving ordinary differential equations with boundary layers. Differential equations will also be used to introduce the concept of multiple timescales.

12. **Course Learning Outcomes:**
   - **CLO 1** – Students will understand big O and little o notation and be able to rank terms in various mathematical expressions by size.
   - **CLO 2** – Students will be able to define and differentiate the terms regular and singular perturbation expansion.
   - **CLO 3** – Students will learn the difference between convergent, divergent, and asymptotic series. They will learn when, why, and how asymptotic series solutions are valid.
   - **CLO 4** – Students will be able to find both regular and singular perturbative roots to polynomials of any order. They will learn how to balance terms for asymptotic consistency.
   - **CLO 5** – Students will learn about the Fredholm alternative in linear algebra and use it to find perturbative expansions of eigenvalues.
   - **CLO 6** – Students will learn and identify dominant regions of integration. They will learn how to isolate different dominant regions and evaluate the resulting integrals.
   - **CLO 7** – Students will learn about boundary layers in differential equations. They will discover their application to various fields and the relevance of them to the mathematical structure of a problem.
   - **CLO 8** – Students will develop the method of matched asymptotic expansions for differential equations. They will formulate outer solutions, inner solutions, and composite solutions understanding the domain of validity for each.

13. **Rationale:**
    This course will expand upon the techniques that graduate students in applied mathematics learn for solving problems. Perturbation methods lead students towards the concept of model reduction which can be used to better understand mechanistic processes that models are describing. Reduced models can simplify and speed up computations. They can also help uncover unidentifiable terms and parameters which can assist with data analysis and fitting. There is no direct overlap with any undergraduate or graduate courses currently on offer, but students will have some exposure to these ideas in MATH 6931, MATH 6655, MATH 6651, MATH 6652, and MATH 6937. While asymptotic methods may be used as needed in those
courses, this course will provide students with a deeper rationale for why the methods work and when they are useful. This knowledge will compliment other technique and application courses in the program.

The learning outcomes of this course are the students will recognize the utility of and be able to apply perturbation methods to problems in engineering and natural sciences. This will build skills in model reduction and improving computational efficiencies. Students will be well-trained for careers in mathematical modelling and scientific computing in both academia and industry.

14. **Evaluation:**
   - **Undergraduate:**
     Students will typically complete a series of homework assignments and a final exam.
     - Homework 3*20% = 60%
     - Exam 40%
   - **Graduate:**
     Students will typically complete a series of homework assignments, a project, and a final exam.
     - Homework 3*16% = 48%
     - Project 20%
     - Exam 32%

   The course project will typically expect students to look at a problem in their research or other courses where perturbation methods could be used to solve the problem or gain additional insight. This requires graduate students to have a deeper understanding of the course material at a level that allows them to extend it to other applications.

15. **Integrated Courses:**
   This course will be integrated with a new course SC/MATH 4940 3.0. As explained above the main separation in assessment between the undergraduate and graduate courses will be the expectation of course projects for graduate students. Completing this project will require a deeper understanding of the course material which is more suitable for a student at the graduate level.

16. **Cross-listed Courses:**
   - N/A
17. **Enrolment Notes:**
   This course may be of interest to students in science and engineering outside of Mathematics.

18. **Faculty Resources:**
   Primary Faculty Member: Iain Moyles
   Alternate faculty members: Huaiping Zhu, Michael Haslam, Huaxiong Huang
   Frequency: every year
   Impact: The impact will be the requirement of one faculty member to teach this course. However, since the course is cross listed with a graduate course then two courses are being serviced by one instructor.

19. **Physical Resources:**
   This course will only require a lecture space for teaching. Any computational components required for the course will be able to be completed with personal computing resources. However, instructors may wish to use existing computer labs (e.g. the Gauss lab) to achieve course objectives.

20. **Bibliography and Library Statement:**
    See separate attachment.
MEMORANDUM
York University Libraries

To: Iain Moyles
From: William Denton
Date: 13 October 2022
Subject: Library Statement of Support – MATH 4940 and 6940 (Perturbation Methods)

Summary

York University Libraries (YUL) is well positioned to support the proposed course in both offerings. Faculty and students can make use of an array of library resources and services to meet their research and learning needs.

Collections

Prof. Moyles listed four books for the course. The main text is *Perturbation Methods* by E.J. Hinch (Cambridge, 1991), which we already have in print. To help support student needs I have ordered an electronic version of this slim 160-page volume. It costs $500 USD, which is unusually expensive, but it is free of any digital rights management, and the title adds to our collection in what seems to be a new topic for a mathematics course. I hope this will make both the teaching and learning easier (and also that one day perhaps a good open textbook will be available for the subject).

The other three books, for secondary use and consultation, are *Advanced Mathematical Methods for Scientists and Engineers I: Asymptotic Methods and Perturbation Theory* by Carl M. Bender and Steven A. Orszag (Springer, 1999), *Introduction to Perturbation Techniques* by Ali H. Nayfeh (Wiley, 2011) and *Introduction to Perturbation Techniques* by Mark. H. Holmes (Springer, 2013). We already have the third available as an ebook, and I have ordered one print copy each of the first two. (They are already available through Omni from other Ontario libraries, but again I am happy to add to our collection to support this new topic.)

For anyone interested in other books on perturbation theory and related topics, the Omni single-search interface provides students with access to a wide range of materials, including books, book chapters, articles, dissertations, etc. Library users may also request items from partner libraries through Omni. The A-Z list on the Libraries’ website provides a complete register of electronic offerings.

Services
Library Instruction

Librarians and archivists help students build research skills and digital fluencies through workshops, online research guides, and individual research assistance. Instructors can arrange a research skills workshop (or seminar) geared to a specific assignment, course, or competency.

Research Guides of Interest:

- Mathematics

Research Help

Online research assistance is available in both French and English via chat, text, and email. In addition, students and faculty can book one-hour research consultations with a specialist librarian. The Libraries also offer a virtual drop-in service hosted through Zoom for help in real-time.

Accessibility Services

Located on the first floor of the Scott Library (Keele Campus), Library Accessibility Services (LAS) provides alternative content formats, as well as adaptive technologies and spaces. With a referral, York University faculty and students can request transcription services or reserve an accessibility lab workstation.
MEMORANDUM

To: Iain Moyles
From: Augustine Wong
Date: October 27, 2022
Subject: Agreement to integration of MATH 4940 and MATH 6940

The proposed MATH 4940 / MATH 6940 adds to the diversity of the applied mathematics course offerings. The course content is of interest to both undergraduate and graduate applied mathematics and statistics students. Furthermore, the proposed course does not infringe on any courses currently offered by the Department of Mathematics and Statistics.

Sincerely,

Augustine Wong
Professor
Undergraduate Program Director / Associate Chair
Department of Mathematics and Statistics
(august@yorku.ca)
The following information is required for all new course proposals. To facilitate the review/approval process, please use the headings below (and omit the italicized explanations below each heading).

1. **Program:** Mathematics and Statistics

2. **Course Number:** MATH 4940

3. **Credit Value:** 3.0

4. **Long Course Title:** Perturbation Methods

5. **Short Course Title:** Perturbation Methods
   *This is the title that will appear on University documents where space is limited, such as transcripts and lecture schedules. The short course title may be a maximum 40 characters, including punctuation and spaces.*

6. **Effective Session:** FW2023

7. **Calendar (Short) Course Description:** This course introduces perturbative methods as techniques for finding approximate solutions to mathematical problems. The course begins with approximating roots to polynomials before exploring applications in linear algebra, integrals, and differential equations.

8. **Expanded Course Description:** This course introduces students to the concept of formal perturbation expansions as a means of approximation. Beginning with polynomial roots students will learn the concept of regular and singular expansions and discuss the concepts of order and term balancing. Students will explore perturbative solutions in linear algebra to decouple nearly degenerate eigenvalues. They will explore a variety of techniques for asymptotically approximating integrals including Laplace’s Method, the method of steepest descent, and successive integration by parts. The concept of matched asymptotic expansions will be introduced through solving ordinary differential equations with boundary layers. Differential equations will also be used to introduce the concept of multiple timescales.

   Prerequisites: SC/MATH 1021 or SC/MATH 1025; SC/MATH 1310 or SC/MATH 1014; SC/MATH 2270 or SC/MATH 2271.
9. Course Learning Outcomes:
   **CLO 1** – Students will understand big O and little o notation and be able to rank terms in various mathematical expressions by size.
   **CLO 2** – Students will be able to define and differentiate the terms regular and singular perturbation expansion.
   **CLO 3** – Students will learn the difference between convergent, divergent, and asymptotic series. They will learn when, why, and how asymptotic series solutions are valid.
   **CLO 4** – Students will be able to find both regular and singular perturbative roots to polynomials of any order. They will learn how to balance terms for asymptotic consistency.
   **CLO 5** – Students will learn about the Fredholm alternative in linear algebra and use it find perturbative expansions of eigenvalues.
   **CLO 6** – Students will learn and identify dominant regions of integration. They will learn how to isolate different dominant regions and evaluate the resulting integrals.
   **CLO 7** – Students will learn about boundary layers in differential equations. They will discover their application to various fields and the relevance of them to the mathematical structure of a problem.
   **CLO 8** – Students will develop the method of matched asymptotic expansions for differential equations. They will formulate outer solutions, inner solutions, and composite solutions understanding the domain of validity for each.

10. Rationale: This course will expand upon the techniques that undergraduate students in mathematics learn for solving problems. Perturbation methods leads students towards the concept of model reduction which can be used to better understand mechanistic processes that models are describing. Reduced models can simplify and speed up computations. They can also help uncover unidentifiable terms and parameters which can assist with data analysis and fitting. There is no direct overlap with any undergraduate or graduate courses currently on offer, but students will have some exposure to these ideas in MATH 4090, MATH 4120, and MATH 4271. While asymptotic methods may be used as needed in those courses, this course will provide students with a deeper rationale for why the methods work and when they are useful. This knowledge will compliment other technique and application courses in the program.

11. Evaluation:
   **Undergraduate:**
   Students will typically complete a series of homework assignments and a final exam.
   Homework 3*20%=60%
   Exam 40%
   **Graduate:**
   Students will typically complete a series of homework assignments, a project, and a final exam.
   Homework 3*16%=48%
   Project 20%
   Exam 32%

   The course project will typically expect students to look at a problem in their research or other courses where perturbation methods could be used to solve the problem or gain additional insight. This requires graduate students to have a deeper understanding of the course material at a level that allows them to extend it to other applications.
12. **Integrated Courses:** This course will be integrated with a new graduate course SC/MATH 6940 3.0. As explained above the main separation in assessment between the undergraduate and graduate courses will be the expectation of course projects for graduate students. Completing this project will require a deeper understanding of the course material which is more suitable for a student at the graduate level.

13. **Crosslisted Courses:** N/A

14. **Faculty Resources:** Primary Faculty Member: Iain Moyles  
   Alternate faculty members: Huaiping Zhu, Michael Haslam, Huaxiong Huang  
   Frequency: every year  
   Impact: The impact will be the requirement of one faculty member to teach this course. However, since the course is cross listed with a graduate course then two courses are being serviced by one instructor.

15. **Physical Resources:** This course will only require a lecture space for teaching. Any computational components required for the course will be able to be completed with personal computing resources. However, instructors may wish to use existing computer labs (e.g. the Gauss lab) to achieve course objectives.

16. **Bibliography and Library Statement:**  
   See separate attachment.
Budget Consultation
Fall-Winter 2022-23

Rhonda Lenton, President & Vice-Chancellor
Lisa Philipps, Provost and Vice-President Academic
Carol McAulay, Vice-President Finance & Administration
Agenda

1. Context

2. Community priorities highlighted in previous years

3. Strategic investments in 2022-23


5. SHARP Budget Model

6. Community feedback – priorities for strategic investments
1. Context

- The University’s SHARP budget model designed to enhance:
  - Transparency around revenues and costs
  - Alignment of resources to our University Academic Plans e.g., 2020-2025 UAP: *Building a Better Future*

- Annual budget consultations since 2018

- 2022-23 budget objectives:
  - Maximize advancement of the University Academic Plan priorities
  - Ensure long-term sustainability of the University
  - Adapt to post-pandemic needs through bold thinking and responding to emerging opportunities
  - Utilize a reasonable portion of the accumulated carry forwards to invest in growth and success

- Budget risks:
  - Federal and Provincial government challenges and priorities
  - Uncertainties around enrolments in a globally competitive market and disruptive world events
  - Inflationary pressures
2. Community Priorities Highlighted in Previous Years
Budget Consultations

Since 2018-19, annual budget consultations each Fall-Winter provide the community:

- Overview of York’s finances
- Update on the current budget
- Opportunity to share input about the budget process and priority areas for investment

The input is integral to developing annual budgets and is shared back with the community in the following year.
Community Priorities for Investment

February 2022
(at the end of 2021-22 cycle of consultations*)

- Re-imagining Space
- Equity Diversity and Inclusion
- Staff Complement
- System Innovation
- Research
- Sustainable Campus
- Learning Technologies
- Front-line Student Supports
- Equity Diversity and Inclusion
- Faculty Complement
- Inter-disciplinarity
- Deferred Maintenance
- Physical accessibility
- IT Infrastructure
- Change Management
- Bilingual services
- Mental Health
- Student Financial Support
- Hybrid Work
- Brand
- Mental Health
- Service Accountability
- Living Well Together

February 2021
(at the end of 2020-21 cycle of consultations)

- Teaching supports
- Sustainability
- Employee Support
- Deferred maintenance
- Mental Health
- Digital Transformation
- Student Financial Support
- Space Utilization
- Complement Renewal
- International Students
- Interdisciplinary Innovation Systems
- Graduate Students
- Performance metrics
- SHARP
- Government Advocacy
- Diversity Hiring
- Enrolments
- Research
- COVID Safety
- Endowment Lands
- Heritage Buildings
- Faculty support
- Student experience

* In 2021-22, 17 sessions were held with Faculty Councils, employee groups, student groups, and a Presidential Town Hall asking for input on budget priorities for 2022-23 and beyond. In total, around 1,000 people attended the consultations.
3. Strategic Investments in 2022-23
The University invests in strategic priorities collectively.
Priority investments in the 2022-23 Budget Plan to support the University Academic Plan

Advancing the DEDI Strategy including the Indigenous Framework, Decolonizing Indigenous Research, Anti-Black Racism Framework and Action Plan

Renewing and diversifying faculty complement to support 21st c learning, knowledge for the future, etc

Investing in 21st century learning e.g., new programs to meet demand and emerging market needs, curricular innovation, credential diversification and micro-credentials, flexible learning opportunities for a diverse student population, high-quality digital learning, experiential education

Supporting research success including emerging areas of research leadership, catalyzing collaborations to promote large-scale research projects, Research Office

Meeting diverse needs of students including high quality student services and targeted programs, initiatives and awards to enhance access, recruitment, excellence, and academic progression, as well as supports during ongoing post-pandemic financial pressures

Enhancing services through digital transformation and system innovation

Advancing strategic and transformative initiatives for the University including strengthening strategic partnerships, infrastructure needs e.g., Vaughan Healthcare Precinct, SoM, iHive

Supporting research success including emerging areas of research leadership, catalyzing collaborations to promote large-scale research projects, Research Office

Continuing to evolve our campuses e.g., Markham, Glendon, Campus Vision and Strategy at Keele, addressing deferred maintenance backlogs

Advancing strategic and transformative initiatives for the University including strengthening strategic partnerships, infrastructure needs e.g., Vaughan Healthcare Precinct, SoM, iHive

Launch of new Global Engagement Strategy including raising our international profile

Strengthening our impact on UN SDGs through innovative research, academic programming, and a collective focus on global well-being supported by a new Sustainability Framework (organizational structure) and Sustainability Strategy
Salary costs of faculty complement generally reside in the Faculties where the appointments are made; the central University Fund and Provost’s Office have also committed bridge funding to support faculty complement renewal, dedicated equity hiring, strategic research hiring, and Markham hiring.
Tenure Stream Faculty Complement (Heads) and Breakdown by Streams and Gender, 2009-10 to 2022-23 (per October 1, excluding Librarians)

Total Tenure Stream Faculty

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Source: Office of the P&VPA

October 2022
Knowledge for the Future, SDG Challenge

• $13.2M to support priorities in the Strategic Research Plan
  • Build on areas of interdisciplinary research strength by increasing the pool of funds available for minor research grants and providing enhanced administrative support
  • Support emerging areas of research leadership by providing CFI matching funds to secure large-scale awards
  • Advance Decolonization, Equity, Diversity and Inclusion by providing funding support for scholarship, research, and related creative activities
  • Create Phase 2 Catalyzing Interdisciplinary Research Clusters (CIRC) that will be focused on UN Sustainable Development Goals (SDGs) and provide matching funds to support the direct costs in selected research projects over the next 3 years

• $6M in bridge funding for faculty complement growth and renewal specifically pertaining to research amplification, intended to support up to 40 strategic hires
From Access to Success

• $40M over the next 3 years to expand student financial assistance offerings and ensure they remain competitive and responsive to student needs, including:
  o Improved entrance scholarships for domestic students recognizing academic excellence
  o A higher volume of domestic and international bursaries
  o A new Tentanda Via award to students demonstrating fortitude, resilience, and a commitment to progressive and sustainable development

• An additional $5M for international student bursaries in 2022-23, recognizing ongoing financial difficulty to access or progress with their academic programs considering the effects of the pandemic
Living Well Together

To diversify faculty complement, build capacity for research success of diverse scholars, and support York’s DEDI Strategy, Indigenous Framework, and Anti-Black Racism Framework:

- $2M for high priority initiatives and support positions to advance indigenization, reconciliation and decolonization, e.g. creating a DEDI Initiatives Fund engaging community members and funding selected proposals, expanding DEDI Speakers Series, developing an Equity Awards Program, etc.

- $3M from the University Fund and Provost’s Office for dedicated Black and Indigenous faculty hires over 3 years, to augment hiring activities in the Faculties

- Investment in support positions for ongoing DEDI work, e.g. AVP Indigenous Initiatives, EDI Program Manager

- Institutional positions to support DEDI in the Faculties
21st Century Learning, Living Well Together

Build an integrated IT environment that enhances service delivery, supports faculty, staff and students, and resolves complexities, by investing:

1. $120M for a new Student System Renewal Program (SSRP) replacing outdated legacy systems – multi-year project expected to conclude in 2025-26 and funded from a combination of capital reserves ($41M) and the central University Fund ($79M)*

2. $4M for automation and service improvements in HR, budgeting and forecasting, Mobile Maximo for facilities, and YU-card mobile credentials

3. Improving teaching and learning supports e.g. SAVY, classroom technology refresh

4. Enabling faculty and staff productivity and post-pandemic capabilities e.g. licensing and expanded after-hours service desk technicians, Office 365 resources, additional application and platform analysts/developers

5. $1.2M in enhanced ongoing cybersecurity capabilities

* Alongside the development of SSRP, the resources required to successfully operate its emerging solutions, e.g. staff support, licensing, cloud technologies and infrastructure etc. are being evaluated and incorporated into multi-year budgets
Living Well Together

Investments in Deferred Maintenance

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Extending the successful Classroom and Washroom Renewal Program:
- Phase 1 originally planned for $30M between 2019-2025 was accelerated to 3 years and is being completed in 2022
- Phase 2 has committed a further $30M over 5 years and will commence in 2023
Working in Partnership – Markham Campus

The University’s largest capital project will open in 2024.

Capital budget:
- Funded from multiple sources including the City of Markham and York Region, external donations, debentures, and a contribution from the University Fund in 2019-20.

Operating budgets:
- The University has developed 10-year operating budgets for the new campus, incorporated into the Budget Plan
- The pre-opening and initial years of Markham’s operations allow for deficit spending as it builds towards break-even. Work is underway to identify opportunities for achieving break-even as early as possible, while also investing in long-term success
- At steady state, the campus will attract approximately 4,200 students and generate an annual surplus, enabling the campus to re-pay its early year deficits, invest in its own renewal, and financially contribute to the institution overall
University Fund Commitments

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<td>Capital Projects and Renovations</td>
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<td>TOTAL</td>
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</table>

* Expanded student awards are paid from Faculty budgets beginning in 2023-24

** Includes high-priority indigenization, reconciliation, and decolonization initiatives, Congress 2023, and $3M for post-pandemic return-to-campus support which will be re-evaluated mid-year
Renewing our Physical Environment: Major Capital Projects

Board-approved capital projects currently underway to advance the academic, research and student success priorities, including (in order of expected completion):

• $72.7M for a new building for the School of Continuing Studies (Fall 2022)
  
  Funded by the School of Continuing Studies

• $7.5M for a modernization of the Faculty of Education’s facilities (Fall 2022)
  
  Funded by the Faculty of Education

• $48.5M for expansion of the Sherman Health Science Research Centre, including a Neuroscience Facility and additional office space (2023)
  
  Funded by capital reserves, external debentures, CFI, the University Fund, and an internal loan with the Faculty of Health

• $12.5M for a new building for the Goldfarb Gallery at York University (2023)
  
  Funded by external donations and the University Fund

• $31.3M for a two-story addition to Vari Hall for the Faculty of Liberal Arts & Professional Studies (2024)
  
  Funded by the Faculty of Liberal Arts & Professional Studies
## Major capital priorities – summary

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>PROJECT SUMMARY</th>
<th>APPROXIMATE SIZE</th>
<th>APPROXIMATE COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. iHive Building (updated from 2nd Science and Engineering Building)</td>
<td>To accommodate growth in Science and Engineering programs and interdisciplinary research with emphasis on the Internet of Things (IOT), Space Engineering, Smart Cities, Mechatronics, and Automation Technologies. Additional science and health programs, as well as interdisciplinary space for Organized Research Units (ORUs)</td>
<td>250,000 sf (new construction)</td>
<td>$220M</td>
</tr>
<tr>
<td>2. Scott Library Improvements (updated program)</td>
<td>Replacement of book stacks with compact, automated book retrieval increasing floor capacity and allowing expanded student study and lounge space, new makerspace, and other collaborative opportunities. Second elevator in an unused shaft will increase circulation and reduce existing traffic bottlenecks.</td>
<td>206,000 sf (renovated space), 28,000 sf (new construction)</td>
<td>$121M</td>
</tr>
<tr>
<td>3. Central Square Revitalization and New Vision (new)</td>
<td>Modernization of Central Square to improve access and services to students, and to revitalize the space to reflect institutional priorities, including sustainability and indigeneity. Create a better sense of place by unifying the needs of multiple stakeholders including LA&amp;PS, Division of Students, Food Services, and Scott Library. Create new flexible multi-use areas, increase student spaces, accessibility, sustainability, and heritage.</td>
<td>254,900 sf renovated space over 3 levels</td>
<td>$198M</td>
</tr>
<tr>
<td>4. Student Services Hub (new)</td>
<td>Central access point for students at the heart of the Keele Campus. State of the art coordinated and adaptable student service model, combining transactional services with learning and developmental opportunities across the student journey, augmented with technology.</td>
<td>46,600 renovated space over 2 levels</td>
<td>$29.5M</td>
</tr>
<tr>
<td>PROJECT</td>
<td>PROJECT SUMMARY</td>
<td>APPROXIMATE SIZE</td>
<td>APPROXIMATE COST</td>
</tr>
<tr>
<td>---------</td>
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<td>-----------------</td>
</tr>
<tr>
<td>5. Vaughan Healthcare Centre Precinct</td>
<td>Collaboration between York University, the City of Vaughan, Mackenzie Health (operator of Cortellucci Vaughan Hospital) and ventureLAB to transform an 82-acre parcel of land at Jane Street and Major Mackenzie Drive into a unique centre of excellence for health, preventive medicine and community care. The precinct is a first-of-its-kind innovation that unites health care providers, teachers and learners with researchers, innovators and business leaders, together on one site, providing opportunities to leverage shared infrastructure needs and ancillary support services, along with shared costs. It’s foreseeable that the precinct would include a number of York programs, e.g. elements of nursing, health-related technologies, disease modelling, and others. York’s longstanding commitment to develop a School of Medicine has been reflected in successive University Academic Plans and the University’s Strategic Mandate Agreements with the government of Ontario. The vote at Vaughan City Council affirms the City of Vaughan’s support for a School of Medicine within the precinct. Most recently, the University submitted a conceptual proposal for the school to government.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
York University’s Keele Campus is where university and city, academia and industry, people and culture meet and thrive. That energy will soon extend from Keele’s historic academic core into four new neighbourhoods, nurturing a dynamic, flourishing, and complete community, and modelling the university’s best and most innovative thinking. The results will demonstrate York’s commitment to community well-being and environmental stewardship – to Living Well Together.
4. Multi-Year Budget Plan
2022-23, 2023-24, 2024-25
1. In 2021-22, the healthy carry forward was maintained due to the prolonged effects of the pandemic on regular University operations, e.g. lower travel, hospitality, conferences, and campus occupancy costs

2. Opportunity to spend down positive carry forward in 2022-23, 2023-24, and 2024-25 to further advance and accelerate the UAP priorities and emerging opportunities

3. Planned in-year deficits based on:
   • strategic draw-down of positive carry forward, continuing to boldly invest while addressing and adapting to post-pandemic needs
   • incurred Markham costs through to opening and steady state
   • significant enrolment contingencies in light of international recruitment challenges

4. Continue to reassess enrolment contingency requirements through Fall-Winter 2022-23 to guide decisions
Operating Budget approved by the Board of Governors in April 2022

<table>
<thead>
<tr>
<th>Operating Revenues</th>
<th>2021-22</th>
<th>2022-23</th>
<th>2023-24</th>
<th>2024-25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government Operating Grants</td>
<td>305.9</td>
<td>308.4</td>
<td>304.3</td>
<td>305.6</td>
</tr>
<tr>
<td>Student Fees</td>
<td>762.0</td>
<td>731.2</td>
<td>780.0</td>
<td>849.2</td>
</tr>
<tr>
<td>Grants and Student Fees Subtotal</td>
<td>1,067.9</td>
<td>1,039.7</td>
<td>1,084.3</td>
<td>1,154.8</td>
</tr>
<tr>
<td>Funding from Donations, Endowments, &amp; Trusts</td>
<td>6.5</td>
<td>7.8</td>
<td>8.2</td>
<td>8.2</td>
</tr>
<tr>
<td>Investment Income</td>
<td>8.9</td>
<td>14.9</td>
<td>13.9</td>
<td>13.5</td>
</tr>
<tr>
<td>Other Recoveries</td>
<td>38.0</td>
<td>40.7</td>
<td>42.8</td>
<td>43.4</td>
</tr>
<tr>
<td>Total Operating Revenues</td>
<td>1,121.2</td>
<td>1,109.1</td>
<td>1,149.2</td>
<td>1,219.9</td>
</tr>
</tbody>
</table>

| Total Operating Revenues, Net of Contingencies | 1,099.3 | 1,103.1 | 1,126.0 | 1,173.3 |

<table>
<thead>
<tr>
<th>Operating Expenditures</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries and Wages</td>
<td>650.8</td>
<td>627.6</td>
<td>651.1</td>
<td>670.3</td>
</tr>
<tr>
<td>Employee Benefits</td>
<td>154.6</td>
<td>145.4</td>
<td>162.4</td>
<td>167.3</td>
</tr>
<tr>
<td>Operating Costs</td>
<td>159.4</td>
<td>123.4</td>
<td>164.0</td>
<td>173.4</td>
</tr>
<tr>
<td>Scholarships and Bursaries</td>
<td>99.7</td>
<td>88.2</td>
<td>96.6</td>
<td>98.2</td>
</tr>
<tr>
<td>Taxes and Utilities</td>
<td>26.2</td>
<td>21.1</td>
<td>24.7</td>
<td>26.7</td>
</tr>
<tr>
<td>Interest on Long-Term Debt</td>
<td>25.1</td>
<td>25.1</td>
<td>25.3</td>
<td>25.6</td>
</tr>
<tr>
<td>Total Operating Expenditures</td>
<td>1,115.9</td>
<td>1,039.9</td>
<td>1,124.1</td>
<td>1,161.4</td>
</tr>
</tbody>
</table>

| In Year Surplus/(Deficit) for Operating Fund, Before Transfers | (16.6) | 72.1 | 1.9 | 11.8 |

| Transfers to Restricted Funds                 |         |         |         |         |
| Transfers to Capital Fund                     | (42.7)  | (63.8)  | (38.5)  | (35.2)  |
| Transfers to Ancillary Fund                   | (4.0)   | (4.2)   | (4.0)   | (3.6)   |
| Transfers to Other Funds                      | (5.3)   | (6.6)   | (5.0)   | (4.4)   |
| Total Transfers to Restricted Funds           | (52.0)  | (74.5)  | (47.4)  | (43.2)  |

| In Year Surplus/(Deficit) for Operating Fund, Before GAAP Adj. | (68.6) | (2.4) | (45.6) | (31.3) |

| Remeasurement of Employee Benefit Plans        |         | (58.1) |         |         |
| GAAP Adjustments                              |         | (58.1) |         |         |

| In Year Surplus/(Deficit) for Operating Fund   | (68.6)  | (60.4)  | (45.6)  | (31.3)  |
| Opening Accumulated Surplus/(Deficit) for Operating Fund | 316.8 | 316.8 | 256.3 | 210.8 |
| Closing Accumulated Surplus/(Deficit) for Operating Fund   | 248.1   | 256.3   | 210.8   | 179.4   |
Key Budget Assumptions

1. Government grants – Strategic Mandate Agreement (SMA3) for 2020-25:
   - Performance-based funding metrics de-coupled from funding for 2020 to 2023 but still being monitored and reported
   - No decision yet by MCU on potential activation in 2023-24
   - York’s target achievement of metrics is 99.9%

2. Student fees:
   - Domestic tuition fees frozen for 2022-2023
   - Government’s new tuition framework for domestic students expected for 2023-24
   - Market factors for international students, fee increase of 4% in 2022-23
   - Enrolment contracts with the Faculties

3. Enrolment contingencies – risk analysis with the Faculties

4. Salaries and benefits – collective agreements
In 2021-22, the closing accumulated surplus in the Operating Budget was $256.3M, comprising:

<table>
<thead>
<tr>
<th>Description</th>
<th>2021-22</th>
<th>2020-21</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Balances in the Divisions and Faculties</td>
<td>144.3</td>
<td>138.0</td>
</tr>
<tr>
<td>2. Balances in General Institutional (GI) reserves</td>
<td>71.0</td>
<td>128.3</td>
</tr>
<tr>
<td>3. Balance in the University Fund</td>
<td>45.5</td>
<td>50.9</td>
</tr>
<tr>
<td>4. Markham</td>
<td>(4.4)</td>
<td>(0.4)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>256.3</strong></td>
<td><strong>316.8</strong></td>
</tr>
</tbody>
</table>

**NOTES:**
1. Balances distributed across the Faculties, Administrative Units, and the School of Continuing Studies and available to them for investing in priorities
2. Balances required to meet various institution-wide financial obligations, e.g. collective agreement funds, pension special payments and post-employment benefits, insurance payments, HR provisions, and a $25M contingency reserve. The reduction in 2021-22 relates to an accounting re-measurement of employee benefit plans
3. The remaining, uncommitted balance of the University Fund, available for use in future years to support institutional priorities.
4. Pre-opening deficit (primarily the payment of debenture interest)
5. SHARP Budget Model
SHARP 2.0

Implemented in 2022-23 following the external review and recommended improvements in 2019-20. Key elements:

1. Budget Cycle and Accountability:
   • Enrolment planning over longer time horizon
   • Multi-year budgets approved by Board each April, before entering the new fiscal year
   • Service Tables for services providers and service users to discuss priorities, needs, resources, and service levels

2. Hold Harmless:
   • Hold Harmless amounts automatically provided to the Faculties based on 2013-14 replaced by transparent method of providing operating support where needed, based on current data and reviewed annually

3. University Fund:
   • 8% annual contributions from the revenue-generating areas (Faculties, School of Continuing Studies, Ancillary Services) for a sustainable, predictable UF to support institutional strategic priorities

4. Governance:
   • Two distinct Councils providing advice to the President -
     o University Fund Council* on time-limited strategic requests of Faculties and Units for University Fund support
     o Budget Council** on base budget requests of shared services Units

5. Interfaculty Revenue Sharing:
   • Options for an enhanced framework being developed by a Working Group of Faculties

*Chaired by the Provost. Membership – VPFA, VPRI, four Resource Faculty Deans representing large and small Faculties, and professional Schools
** Chaired by the President. Membership – Divisional VPs, all Resource Faculty Deans, Executive Director of the School for Continuing Studies
SHARP Website

https://www.yorku.ca/sharp/
6. Community Feedback – What should be prioritized for investment in the next multi-year budgets?