COUNCIL OF THE FACULTY OF SCIENCE



NOTICE OF MEETING

February 13, 2024 3pm – 4:30pm via Zoom

AGENDA

- 1. Call to Order and Approval of Agenda
- 2. Chair's Remarks
- 3. Approval of January 9 2024 Minutes
- 4. Business Arising
- 5. Inquiries and Communications> January 25, 2024 Senate Synopsis
- 6. Dean's Remarks
- 7. Associate Dean & Head of Bethune College Remarks
 - a) Associate Dean, Curriculum & Pedagogy
 - b) Associate Dean, Faculty Affairs
 - c) Associate Dean, Research & Partnerships
 - d) Associate Dean, Students
 - e) Head of Bethune College
- 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) Undergraduate Curriculum Committee:
 - > Consent agenda items
- 11.Other Business
 - a) Discover York Academics update Jennifer Steeves, Professor and Associate Vice-President Research and Anna Kajor, Project Manager, DYA <u>Visit Website</u>
 - b) YSciCore Vivian Saridakis, Associate Dean, Research and Partnerships

COUNCIL OF THE FACULTY OF SCIENCE



science

MINUTES

January 9, 2024 3pm – 4:30pm via Zoom

MINUTES

- Call to Order and Approval of Agenda Chair of Council, N. Kovinich, called the meeting to order and a motion was moved, seconded and carried to approve the Agenda with one amendment to extend the meeting by 30 minutes.
- 2. Chair's Remarks N. Kovinich welcomed Council and wished council a Happy New Year.
- 3. Approval of December 12, 2023 Minutes A motion was moved, seconded and carried to approve the Minutes.
- 4. Business Arising There was none.

5. Dean's Remarks

Dean Wang welcomed council back to campus from the holidays.

Dean Wang shared that he met with the Science Student Caucus and left inspired after the conversation.

Dean Wang highlighted two things from the Auditor General Report related to the Faculty of Science:

1. Financial sustainability: The Faculty of Science has had an in-year deficit for 4 out of the last 5 years: 2018, 2019, 2020, 2021. Multiple factors have contributed to these deficits. Mostly significantly are the decreased government funding, freezing tuition fee over the last many years, COVID-19, below-target international student enrolment. The transition of our internal budgeting model from SHARP 1.0 to SHARP 2.0 also presented a challenge. We are gradually trying to overcoming this and are on the right path.

2. "The Faculty of Science has launched three new undergraduate programs in recent years (Mathematical Finance, Mathematical Biology and Data Science) to differentiate its offerings from other Greater Toronto Area universities and attract high-achieving students..."

The Auditor General's Report applauded the Faculty on its new cutting-edge curriculum and its teaching quality.

Dean Wang continued updating the council on Faculty of Science's enrolment and financial situation. He gave a high-level summary of Faculty of Science's 2024-25 budget. With a total revenue of \$63M and expenses of \$68.4M, the Faculty of Science will have an in-year deficit of \$5.4M. Our target for 2024-25 cost containment is \$2.6M. In the coming weeks, FSc community will be consulted for ideas of revenue generation and cost containment. FSc's rolling budget with \$2.6M cost containment needs to be presented to Provost's Office before Feb. 23, 2024.

6. Associate Dean and Head of Bethune College Remarks

a) Associate Dean, Curriculum & Pedagogy H. Kouyoumdjian:

Please contact <u>sciadcp@yorku.ca</u> for assistance and resources for implementing pedagogy in your courses.

Please contact <u>sciadcp@yorku.ca</u> if you are interested in creating a microcredential.

b) Associate Dean, Faculty Affairs

G. Audette:

Friendly reminder to have TAs and Course Directors to complete workload documents.

c) Associate Dean, Research & Partnerships

V. Saridakis:

CFI IOF information was sent to those who are eligible, submissions are due January 22, 2024.

We are in the process of launching the 2024 USRA Competition. Of special note is that due to the increase in the Ontario minimum wage, the total award has increased to 9268\$ of which NSERC provides \$6000 and the supervisor must agree to provide \$3268.

d) Associate Dean, Students

M. Scheid: No remarks.

e) Head of Bethune College J. Amanatides: No remarks.

7. Reports from Science Representatives on Senate Committees There was none.

8. Report from Student Caucus Representative

Natalie Moussa suggested that professors continuously remind first year students to take advantage of the PASS peer tutoring program.

- 9. Reports from Standing Committees of Council
 - a) Executive Committee:
 - > Vacancies report on the Standing Committees of FSc Council N. Kovinich noted the vacancies that remain.
- 10.Other Business
 - a) Budget Consultations Rhonda Lenton, President and Vice-Chancellor, Lisa Philipps, Provost and Vice-President Academic, Carol McAulay, Vice-President Finance & Administration

Carol McAulay and Lisa Phillips presented the Science Budget Consultations Fall Winter 2023-24 and took questions from council.

b) Dean's Re-appointment Process - Lisa Philipps, Provost & Vice-President Academic

Lisa Phillips lead the Dean's Re-appointment discussion.

Meeting Adjournment

A motion was moved, seconded and carried to adjourn the meeting.

ATTENDANCE

Tianna McFarlane Jerusha Lederman Nikola Kovinich Alex Wiscicka Rui Wang Vera Pavri Neal Madras Mark Bayfield Yuna Hwang Gerald Audette Robin Metcalfe Wendy Booth Ada Chan Tom Kirchner Sibonile Siyakatshana Wendy Taylor Mike Scheid Robert Tsushima **Taline Apelian-Sutor** Gino Lavoie Iain Moyles Brad Sheeller (non-voting guest) John Amanatides Karen Hall Carol Bucking Hovig Kouyoumdjian Jade Atallah Vivian Saridakis Mingming Li Eva Hughes Jennifer van Wijngaarden Natalie Moussa Mark Vicari Dawn Bazely Lesley Milley Sara Jazaeihaghighi Matthew George James Elwick Satyam Verma Violeta Gotcheva margaret mroziewicz Melissa Hughes Helen McLellan Stan Jerzak Pat Hall

Casey McKenna Shon Lazarev Thomas Baumgartner Conor Douglas Ryan Hili Muhammad N Yousaf Gordon Fitch Helen Abraham Tamara Kelly Natacha Sam Lisa Philipps carol mcaulay Jean-Paul Paluzzi Heffernan, Jane Christopher Caputo Wendy Miller Ruella Ella Ordinaria Sapna Sharma Jessica Wyman Derek Wilson Derek J Wilson



The Senate of York University

Meeting Synopsis

The 702nd Meeting of Senate Held on Thursday, 25 January 2024, via Zoom

Remarks

The Chair, Poonam Puri, thanked members for attending the January 18 special Senate meeting. The Chair also shared that Amanda Wassermuhl, Assistant Secretary of the University, is leaving the University Secretariat to take on a new opportunity at Osgoode Hall. She joined her Secretariat colleagues in thanking Amanda for her valuable contributions supporting governance and her warm collegiality, and wished her success at Osgoode.

The President spoke to the financial pressures facing the University, including uncertainties and deficits projected by many institutions, and the anticipation of the government's response to the Blue Panel Report regarding funding. She highlighted missed international enrollment targets and the imposition of federal caps contributing to substantial deficits. The University's response to these financial challenges involved beginning to prioritize for the 2025-2030 University Academic Plan (UAP), expanding research in alignment with Strategic Research Plan, increasing external revenue, and engaging with COU to advocate for government funding in the upcoming provincial budget.

Approvals

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

- Add two new fields to the MA and PhD degree programs in Humanities, Faculty of Liberal Arts and Professional Studies, effective Fall 2024
- Add a new field in Indigenous History, rename the East Asian History field to Asian History, and merge the British History field with the European History field in the MA and PhD degree programs in History, Faculty of Liberal Arts and Professional Studies, effective Fall 2024
- Establish 90-credit BA and BSc degree programs in Movement and Health, School of Kinesiology and Health Science, Faculty of Health, effective May 2024
- Revise the Policy and Procedure on Academic Accommodation for Students' Religious Observances
- Revise the definition of *Professional Masters* in the University Academic Nomenclature

York University Senate

• Addition of a part-time entry option for the Master in Environmental Studies, Faculty of Environmental and Urban Change, effective Fall 2024

Reports

Senate received the December 2023 written report from the Academic Colleague, Senator William van Wijngaarden.

Under the auspices of the Academic Policy, Planning and Research Committee, Vice-President Research & Innovation presented the 2022 Annual Report on Research.

Notice of Statutory Motions

The Executive Committee provided Notice of Statutory Motion for revisions to the Senate Rules.

APPRC provided Notice of Statutory Motion for the establishment and disestablishment of academic units at Glendon and engaged Senators in a preliminary discussion about the proposed changes.

Committee Information Items

Executive

The Executive Committee's information items included the following:

- Senate ASCP Committee's priorities for 2023-2024
- Status of its review of the Senate Policy on Academic Implications of Disruptions of Cessations of University Business Due to Labour Disputes or Other Causes

Academic Policy, Planning and Research (APPRC)

APPRC reported on the following items:

- The Committee's discussion of the Value-for-Money Audit: York University Operations and Capital report and actions in resonse to the audit recommendations
- Progress report on the implementation of plans for the delivery of academic programming at the new Markham Campus, launching FW 2024-2025

Academic Standards, Curriculum and Pedagogy (ASCP)

ASCP reported on the following items:

York University Senate

- Minor modifications to degree requirements at the Glendon, Health, Lassonde and Schulich Faculties
- The Committee's review of the Senate policy on Sessional Dates and the Scheduling of Examinations
- The implementation of the digital YU identification card
- The Committee's ongoing review of other Policy items, including the Senate Policy on Academic Conduct, the Attending Physician Statement and Grading Schemes

A Synopsis of the November 27, 2023 meeting of the Board of Governors was received for information.

Additional Information about this Meeting

Please refer to the full Senate agenda and supplementary material <u>posted online</u> with the **25 January 2024** meeting for details about the items reported.

Senate's next meeting will be held at 3:00 pm on Thursday, 15 February 2024.

2023-2024 FSc Report on vacancies for Senate and FSc Standing Committees of Council



RATIFICATION OF NOMINATIONS

Undergraduate Curriculum Committee: A. Basher, Undergraduate Student Representative (term 2023 – 2024)

2023-2024 FSc Report on vacancies for Senate and FSc Standing Committees				
Committee	Rules of Faculty Council - membership	Meeting time / Membership	Term	
	According to the York University Secretariat based on the Senate Rules	As per Senate website	Troin	
	and Procedures governing the size and composition of Senate, the Faculty of Science shall have twelve members, including a minimum of two			
	Chairs. According to The Rules of Council (Science), Faculty			
	representation shall include the Director of Natural Science, three Department Chairs, and terms shall be for three years			
	Dean, Ex officio	R. Wang	Designated	
	Member at large	G. Audette	Designated	0004
	Member at large	EJ Janse van Rensburg, Mathematics & Statistics	2023	2024
Senate	Member at large	T. Baumgartner, Chemistry	2021	2024
	Member at large	J. Elwick, Science, Technology & Society	2022	2025
	Member at large	V. Saridakis, Biology	2021	2024
	Department Chair	V. Pavri, Department of Science, Technology & Society	2021	2024
	Department Chair	R. Isushima, Department of Biology M. Haslam, Department of Mathematics & Statistics	2021	2024
	Director of NATS	R. Metcalfe, Dvision of Natural Science	Designated	
	Student representative	Yuna (Aria) Hwang	2023	2025
Escultu Occurs'i	Student representative	Shon Lazarev	2023	2025
Faculty Council	Chair of Council	N. Kovinich	2023	2024
	Vice-Chair of Council	M. Yousaf	2023	2024
Staff Representatives		W. Booth	2023	2024
		D. Hossain	2023	2024
50. Barris 6. 0		YY. AU	2023	2024
FSC Reps on Senate Committees	1 member from ESa	T. Doumsering	2024	2024
Senate Executive Academic Policy, Planning and Research Committee	I member nom FSC	1. Baumgartner	2021	2024
(APPRC)	1 member from FSc	G. Monette	2023	2026
ASCP (Academic Standards, Curriculum and Pedagogy				
Committee) Senate Tenure & Promotion	1 member from FSc	M. Armour	2021	2024
Sub-Committee on Honorary Degrees & Ceremonials	1 member from FSc	VACANT	2023	2026
	The Executive Committee shall be chaired by the Chair of Council and	Executive Committee normally meets the first Tuesday of each month (September to May) from		
	include the Vice-Chair of Council, the Secretary of Council, and one	3pm - 430pm		
	Statistics, Physics & Astronomy, and Science, Technology &			
	Society/Natural Science, the Dean of the Faculty of Science (ex officio),			
	one student member of Council, and one of the staff members elected to			
	Council.			
Executive Committee	Chair of Council	N. Kovinich M. Yousaf	2023	2024
	Dean, Ex officio	R. Wang	Designated	2024
	Asst. Dean - SEM & SEP	Eva Hughes	Designated	
	Staff representative	W. Booth Taline Anelian Sutor	2023	2024
	Biology	M. Vicari	2023	2024
	Chemistry	D. Wilson	2022	2025
	Math & Stats	E. J Janse Van Rensburg	2022	2025
	Science. Technology & Society	C. Douglas	2023	2024
	The Academic Policy and Planning Committee shall include the Dean or	APPC will normally meet the last Thursday of each month (September to April) from 9:00 am -		-
	designate (ex officio), the Master of Norman Bethune College and one	10:30 am		
	Statistics, Physics & Astronomy, and Science, Technology &			
	Society/Natural Science, one student member of Council, and one of the			
	staff members elected to Council.			
APPC	Associate Dean, Faculty Affairs, Ex officio	G. Audette	Designated	
AITO	Head of Bethune College	J. Amanatides	Designated	0001
	Undergraduate Student Representative	Seerat Choudhry	2023	2024
	Biology	R. Schott	2023	2024
	Chemistry	R. Fournier	2023	2026
	Math & Stats	P. Szeptycki	2023	2026
	Physics & Astronomy	E. Hessels	2023	2024
	Science, Lechnology & Society The Curriculum Committee shall include the Dean and an Associate Dean	S. Durneninos	2022	2025
	(ex officio), the Chair or nominee from each teaching Division or	April) from 9:00 - 10:30 am		
	Department, three members elected by Council and two student members			
	Member at Large	VACANT	2023	2026
	Member at Large	VACANT	2023	2026
Undergraduate Curriculum Committee	Dean, Ex officio	R. Wang	Designated	<u> </u>
Undergraduate Curriculum Committee	Undergraduate Student Rep	Lomesh Choudhary	2023	2024
	Undergraduate Student Rep	A. Basher	2023	2024
	Biology	J. Atallah	2022	2025
	Math & Stats	M.W. Wong	2022	2025
	Physics & Astronomy	M. George	2021	2024
	Science, Technology & Society	R. Metcalfe	2022	2025
	Member at Large	L. Robertson	2023	2026

2023-2024 FSc Report on vacancies for Senate and FSc Standing Committees				
Committee	Rules of Faculty Council - membership	Meeting time / Membership	Те	erm
	The Committee on Examinations and Academic Standards shall consist of an Associate Dean (<i>ex officio</i>), five members elected by Council from each of Biology. Chemistry, Mathematics & Statistics, Physics & Astronomy and Science, Technology & Society/Natural Science, and one student member of Council.	CEAS will normally meet every alternate Wed / Thurs from 1:00 - 3:00 pm year round.	From	То
CEAS	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 Larce. An alternate can only vote in			
	the event that first elected members are not in attendance. Associate Dean - Students, Ex officio	M. Scheid	Designated	2024
	Undergraduate Student Rep	Yashna Manek	2023	2024
	Chemistry Math & Stats Physics & Astronomy Science, Technology & Society The <u>Petitions Committee</u> for the purpose of hearing student petitions shall consist of an Associate Dean (<i>ex offici</i>), six members of Council, and two student members of Council. The Committee may divide the workload by	J. Saby 7 ALT 7 McMrd P. Johnson & T.Zeng / ALT T. Mirkovic I. Moyles, N.Purzitsky / ALT. Y. Gao C. Storty & VACANT / ALT. E. Hyde J. Webb / ALT. S. Domenikos Each panel meets once a month on Wednesday or Thursday from 2:30 pm - 4:00 pm	2023/2021 2023/2023 2021/2022 2023/2023 2023/2023	2026/2024 2026/2026 2025/2025 2024/2024 2026/2026
	splitting the Committee membership into two paniels 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. Associate Dean, Ex officio Undergraduate Student Rep	M. Scheid Claire Del Zotto	Designated 2023	2024
	Undergraduate Student Rep Member at Large	Ruella Ella Ordinaria S. Morin	2023 2023	2024 2026
	Biology Chemistry	C. Jang R. Fournier	2022	2025
	Physics & Astronomy	S. Jerzak	2022	2025
	Math & Stats Science, Technology & Society	J. Rogerson	2022	2025
	Member at Large	A. Mills	2022	2026
SRC T & P Committee	The Committee on Tenure and Promotions shall consist of one currently tenured member from each of Biology, Chemistry, Mathematics & Statistics, Physics & Astronomy and Science, Technology & Society/Natural Science elected by Council, and one student member of Council. No member of the Committee shall be a member of another Tenure and Promotions Committee at any time during their tenure on this committee.	SRC T & P Committee will normally meet the last Friday of each month (September to May) from 9:00 am - 11:00 am in LUM 3058		
	In addition to the above membership of the committee, Council shall elect an alternate member from each of the Units mandated 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 shall be selected by the Science Student Caucus from one of its Members-at-Large on an annual basis. An alternate can only vote in the event that existing members are not in attendance.			
	Undergraduate Student	Addette	2023	2024
			2020	
	Biology Chemistry	D. Bazely / ALT. M. Bayfield A. Orellana/ ALT. D. Ifa	2023/2023 2023/2023	2026/2026 2026/2026
	Biology Chemistry Physics & Astronomy	D. Bazely / ALT. M. Bayfield A. Orellana/ ALT. D. Ifa M. Horbatsch /ALT. C. Bergevin	2023/2023 2023/2023 2023/2023	2026/2026 2026/2026 2024/2024
	Biology Chemistry Physics & Astronomy Math & Stats	D. Bazely / ALT. M. Bayfield A. Orelinari ALT. D. Ifa M. Horbatsch / ALT. C. Bergevin Y. Gao / ALT Jianhong Wu E. Home / ALT D. Luceui	2023/2023 2023/2023 2023/2023 2023/2023 2021/2022	2026/2026 2026/2026 2024/2024 2024/2025 2026
	Biology Chemistry Physics & Astronomy Math & Stats Science, Technology & Society Currently, the Committee on Teaching and Learning shall consist of a minimum of two Faculty members from each department, the Associate Dean – Students, one Librarian, one staff member, one undergraduate student, and two graduate students, in addition to other members invited as provided for by the Rules. Graduate students and staff nominees will indicate their interest in serving on the committee in writing to the committee, who will then approve by majority vote.	D. Bazely / ALT. M. Bayfield A. Oreilana/ ALT. D. Ifa M. Horbatsch /ALT. C. Bergevin Y. Gao / ALT Jianhong Wu E. Hamm / ALT. D. Lungu CoTL normally meets every third Thursday of each month (September to May) from 10:00 am - 11:30 am	2023/2023 2023/2023 2023/2023 2023/2023 2021/2022 2023	2026/2026 2026/2026 2024/2024 2024/2025 2026
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CoTL	Biology Chemistry Physics & Astronomy Math & Stats Science, Technology & Society Currently, the Committee on Teaching and Learning shall consist of a minimum of two Faculty members from each department, the Associate Dean – Students, one Librarian, one staff member, one undergraduate student, and two graduate students, in addition to other members invited as provided for by the Rules. Graduate students and staff nominees will indicate their interest in serving on the committee in writing to the committee, who will then approve by majority vote. Associate Dean - Students, Ex officio Associate Dean - Students, Ex officio Indergraduate Student Representative Graduate Student Representative Undergraduate Student Representative Staties Science Library, Designated	D. Bazely / ALT. M. Bayfield A. Oreilana/ ALT. D. Ifa M. Horbatsch /ALT. D. Ifa M. Horbatsch /ALT. C. Bergevin Y. Gao / ALT Jianhong Wu E. Hamm / ALT. D. Lungu COTL normally meets every third Thursday of each month (September to May) from 10:00 am - 11:30 am M. Scheid H. Kouyoumdjian J. MacPherson Aysa Tajeri Kirli Vaswani VACANT V. Cetheron	2023/2023 2023/2023 2023/2023 2023/2023 2023/2023 2021/2022 2023 2023 2023 2023 2023 2023 2023	2026/2026 2026/2026 2024/2024 2024/2025 2024/2025 2026 2024 2024 2024 2024 2024
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2023-2024 FSc Report on vacancies for Senate and FSc Standing Committees				
Committee	Rules of Faculty Council - membership	Meeting time / Membership	Te	rm
	•		From	То
Graduate Curriculum Committee	To provide 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 Diploma Academic Requirements, New Graduate Fields, New Graduate Diploma Academic Requirements, New Graduate Fields, New Graduate Diplomas, New Graduate Education committee shall consist of: - Associate Dean – Research & Graduate Program in the 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 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 curroluum approvals at the Faculty-level. The Chariot the Committee is selected by the voting members of the Committee for a one-year term.	Meeting is held based on availability.		
	Associate Dean – Associate Dean Students (ex officio)	M. Scheid	Designated	
	Biology	J. Paluzzi	2023	2026
	Chemistry	R. Hili	2023	2026
	Physics & Astronomy	A. Muzzin	2023	2026
	Math & Stats	P. Ingram	2023	2026
	Science, Technology & Society	VACANT	2023	2026
	Member from Faculty of Health OR Lassonde	VACANT	2023	2026
	Member at Large	D. Golemi-Kotra	2023	2026
	Graduate student	Farnaz Mansouri-Noori	2022	2024
Committee on Equity, Diversity & Inclusion	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 form 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 - EDI experiences in Teaching and Learning - Associate Dean, Faculty Affairs (ex officio) - Associate Dean, Faculty Affairs (ex officio) - One primary and one alternate member from each of Biology, Chemistry, Mathematics & Statistics, Physics & Astronomy and Science, Technology & Society .	Meeting is held the last Wednesday of every month.		
	One undergraduate student Associate Dean - Faculty, ex officio	G. Audette	Designated	
	Associate Dean, Research & Partnerships (ex officio)	V. Saridakis	Designated	
	Undergraduate Student Representative	Adriano Tersioni	2023	2024
	Graduata Student	Aishwana Subramanian	2022	2024
		Themes Verbauere	2023	2024
	Graduate Student	Thomas vacheresse	2023	2024
	Biology	1. Kelly	2021	2024
	Chemistry	C. Young	2023	2026
	Physics & Astronomy	P. Scholz	2023	2026
	Math & Stats	A. Woldegerima ALT A. Lumley	2022	2025
	Science, Technology & Society	V. Pavri	2023	2024

CURRICULUM COMMITTEE REPORT



FEBRUARY 2024

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 January 30, 2024 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 scienter (with all members of the Curriculum Committee or by contacting the Secretary of the Committee at scienter (with all members of the Curriculum Committee or by contacting the Secretary of the Committee at scienter (with all members of the Curriculum Committee or by contacting the Secretary of the Committee at scienter (with all members of the Curriculum Committee or by contacting the Secretary of the Committee at scienter (with all members of the Curriculum Committee or by contacting the Secretary of the Committee at scienter (with all members of the Curriculum Committee or by contacting the Secretary of the Committee at scienter (with all members of the Curriculum Committee or by contacting the Secretary of the Committee at scienter (with all members of the Curriculum Committee or by contacting the Secretary of the Committee at scienter (with all members of the Curriculum Committee at scienter (with all members of the Curriculum Curriculum Curriculum Curriculum Curriculum Curriculum Curriculum Curriculum Curriculum") (with all members of the Curriculum Curriculum Curriculum") (with all members of the Curriculum Curricu

1.1 <u>MATH</u>

- 1.1.1 New Course Proposal: MATH 4282 Mathematics of Life Contingencies 3
- **1.1.2** New Course Proposal: MATH 4283 Ratemaking Methods for Property & Casualty Insurance
- **1.1.3** New Course Proposal: MATH 4284 Reserving Methods for Property & Casualty Insurance

1.2 <u>NATS</u>

- **1.2.1** Changes to Existing Course: NATS 1525 Extraterrestrial Life: A Modern Discussion to include Historical, Religious and Cultural Aspects
- **1.2.2** Changes to Existing Course: NATS 1550 Animal Migration
- **1.2.3** Changes to Existing Course: NATS 1575 Forensic Science An Introduction
- 1.2.4 Changes to Existing Course: NATS 1680 The Genetic Revolution
- 1.2.5 Changes to Existing Course: NATS 1920 Great Mathematical Minds

1.3 Memorandum - Changes to New Course Proposal Form and Change in Existing Course Form

New Course Proposal Form

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: B.A. Honours and B.A. Specialized Honours in Actuarial Science

2. Course Number: MATH 4282

3. Credit Value: 3.0

- 4. Long Course Title: Mathematics of Life Contingencies 3
- 5. Short Course Title: Mathematics of Life Contingencies 3

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: Summer 2025.

7. Calendar (Short) Course Description:

This is the description of the course as it will appear in the University course repository and related publications. Calendar (short) course descriptions should be written in the present tense and may be a maximum of 60 words. Please include information with respect to any pre-/co-requisites and/or crosslisting or integration in the course description. Please indicate if the language of instruction is other than English.

This is an advanced level course on the mathematics of life contingencies. The topics include: profit testing for life insurance, pension plan and retirement benefits, Universal Life insurance, and embedded options in life insurance and annuity products. This course, combined with MATH 3281, ensures an adequate preparation for the ALTAM exam of the society of Actuaries.

Prerequisites: MATH 3281 3.0.

8. Expanded Course Description:

This is the detailed course description that will be published in course outlines, program handbooks, etc. Expand upon the short description in order to give academic approval committees a full and clear sense of the aims and objectives of the course and the types of materials it will cover.

This is an advanced level course on the mathematics of life contingencies. It builds on MATH 3280 and MATH 3281 and explores advanced topics on complex long-term insurance products and retirement solutions. The topics covered include: profit testing for traditional and non-traditional life insurance, design of defined benefit and defined contribution pension plan, evaluation, accretion, and funding of retirement benefits, policy design and benefits payable of Universal Life insurance, pricing and valuation of embedded options in life insurance and annuity products. This course, combined with MATH 3281, ensures an adequate preparation for the Advanced Long-Term Actuarial Mathematics (ALTAM) exam of the Society of Actuaries.

Prerequisites: MATH 3281 3.0.

9. Course Learning Outcomes

(Necessary for Quality Assurance approval and cyclical program reviews)

What will students be able to do upon completion of this course specifically?

Upon successful completion of the course, students are expected to meet the learning objectives listed for each topic below:

- Profit Analysis:
 - Calculate and interpret common profit measures such as expected profit, actual profit, gain, gain by source and period, profit signature, profit vector, net present value, internal rate of return, profit margin, and discounted payback period for long-term life and health insurance, and annuity contracts.
 - Calculate premiums for long-term life and health insurance and annuity contracts based on a specified profit objective.
 - Calculate reserves for long-term life and health insurance and annuity contracts using profit testing.
- Pension Plans and Retirement Benefits:
 - Calculate replacement ratios for Defined Contribution (DC), and Defined Benefit (DB) plans, including final average salary (FAS), career average earnings (CAE), and career average revalued earnings (CARE) plans.
 - Calculate the required contribution rate to meet a target replacement ratio for a DC plan participant, using a deterministic approach.
 - Identify, interpret, and apply service table and salary scale functions for pension plan valuation.
 - For a DB plan, calculate and interpret replacement ratios, accrued benefits, including benefits on early exit from the plan.
 - For a DB plan, calculate and interpret the actuarial accrued liability and the normal cost for benefits payable on age retirement or early exit using the projected unit credit (PUC) and traditional unit credit (TUC) valuation methods.
 - Identify and interpret the assumptions and funding methods used for retiree health care valuation.
 - Calculate and interpret the expected present value of future benefits, accumulated postretirement benefit obligation (APBO), and the normal cost or service cost for retiree health care plans.
- Universal Life Insurance:
 - Understand the cashflows and calculate account values and benefits under Type A and Type B Universal Life policies.
 - Calculate reserves for no-lapse guarantees.
 - Use deterministic profit testing to calculate premiums and to assess emerging surplus for Universal Life insurance.
- Embedded Options in Life Insurance and Annuity Products:
 - Define and calculate payoffs under each of the following options embedded in insurance and annuity contracts:
 - Guaranteed minimum death benefit.
 - Guaranteed minimum maturity benefit.
 - Guaranteed minimum income benefit.

- Guaranteed minimum withdrawal benefit.
- Value the following options embedded in insurance and annuity contracts, using the Black Scholes model:
 - Guaranteed minimum death benefit.
 - Guaranteed minimum accumulation/maturity benefit.
- Construct a replicating portfolio for the embedded options using delta-hedging.
- o Understand and evaluate the costs associated with discrete-time rebalancing.

10. Rationale:

Please indicate how the proposed course will contribute to the academic objectives of the program. Please provide a description of the learning outcomes/objects for the course. As well, please indicate the relationship of the proposed course to other existing options, particularly with respect to focus/content/approach. If overlap with other existing courses exists, please indicate the nature and extent of consultation that has taken place. Additionally, please append the graduate program's existing learning outcomes as a separate document.

This course is needed in response to the recent changes of the professional exams of the Society of Actuaries and to accomplish the accreditation process of York's Actuarial Science program with the Society of Actuaries.

Due to the recent changes of the Society of Actuaries' curriculum, York's MATH 3280 and MATH 3281, do not cover the material needed to prepare our students for writing the ALTAM professional exam; this needs to be repaired in advance of our submission to request the title of the Centre of Actuarial Excellence with the Society of Actuaries (the actuarial programs at the University of Toronto, Western, Waterloo are all <u>Centres of Actuarial Excellence</u> with the Society of Actuaries).

York's aspirations to secure the prestigious title of Centre of Actuarial Excellence date back to 2017, when our Actuarial Science program was created and since which we hired two new faculty members in actuarial science (both faculty members hold professional designations of the Society of Actuaries).

The proposed course builds on two existing courses in mathematics of life contingencies, MATH 3280 and MATH 3281. The course extensively explores modern, intricate long-term insurance products and retirement solutions, effectively bridging the gap between York University's current actuarial curriculum and the dynamic practices within the life insurance industry. This course is distinct from any existing offerings at York University, providing students with essential skills to adeptly evaluate and manage those complex products, enabling informed decision-making. Successful completion of the course ensures thorough preparation for the Advanced Long-Term Actuarial Mathematics (ALTAM) exam conducted by the Society of Actuaries.

11. Evaluation:

Please supply a detailed breakdown of course requirements, including the type and percentage value of each assignment. The expectation is that course assignments can normally be accomplished within the course period. If applicable, details regarding expectations and corresponding grading requirements with respect to attendance and participation should be provided.

Students will typically complete 4 homework assignments, one for each topic listed below:

- 1. Profit Analysis.
- 2. Pension Plans and Retirement Benefits.

3. Universal Life Insurance.

4. Embedded Options in Life Insurance and Annuity Products.

Each homework assignment may contain written questions, computation questions, and case studies. Students will also complete a midterm exam and a final exam. The assessments outlined in this course aim to enable students to demonstrate their understanding, analytical abilities, and proficiency in handling the course materials.

Homework assignment $(4 \times 10\% = 40\%)$ Midterm Exam (20%) Final Exam (40%)

12. Integrated Courses: None.

Graduate courses may be integrated only with undergraduate courses at the 4000-level, where it is understood that 4000-level indicates an advanced level. Graduate students will be expected to do work at a higher level than undergraduates. If the proposed course is to be integrated, please provide a grading scheme that clearly differentiates between the work that undergraduate and graduate students perform, including a description of how the work performed by graduate students is at a higher level. As well, please indicate the course information for the undergraduate course (i.e., Faculty/unit/course number/credit value) and include a statement from the relevant undergraduate chair or undergraduate director indicating agreement to the integration.

13. Crosslisted Courses: None.

Crosslisted courses are offered between two or more graduate programs. For crosslisted courses, please include a statement of agreement from the director of the other graduate program(s).

14. Faculty Resources:

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.

Primary faculty member: Dongchen Li.

Alternative faculty members: Jingyi Cao and Edward Furman.

The course is expected to be offered on an annual basis. The impact will be the requirement of one faculty member to teach this course. As in the case of other 3rd and 4th year actuarial courses, one weekly tutorial of an hour is required. Dongchen Li is expected to teach the course in Fall 2025.

15. Physical Resources:

Please provide a statement regarding the adequacy of physical resources (equipment, space, labs, etc.), including whether or not additional/other physical resources are required and how the need for these additional/other physical resources will be met.

This course requires a classroom with a projector and a computer.

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.

Boyle, P.P. and Schwartz, E.S. (1977). Equilibrium prices of guarantees under equity-linked contracts. *Journal of Risk and Insurance* 44, 639–66.

Brennan, M.J. and Schwartz, E.S. (1977). The pricing of equity-linked life insurance policies with an asset value guarantee. *Journal of Financial Economics* **3**, 195–213.

Dickson, D., Hardy, M., & Waters, H. (2019). *Actuarial Mathematics for Life Contingent Risks* (3rd ed., International Series on Actuarial Science). Cambridge: Cambridge University Press. doi:10.1017/9781108784184.

McDonald, R.C. (2006). *Derivatives Markets*, 2nd edition. Upper Saddle River: Addison Wesley.

McGill, D. M., Brown, K. N., Haley, J. J. and Schieber, S. J. (2005). *Fundamentals of Private Pensions*, 8th edition. New York: Oxford University Press.

Møller, T. (1998). Risk minimizing hedging strategies for unit-linked life insurance contracts. *ASTIN Bulletin* 28, 17–47.

Additional Sections in the Online Form.

Course Design: Indicate how the course design will support students in achieving the learning outcomes. Please detail any aspects of the content, delivery, or learning goals that involve "face-to-face" communication or non-campus attendance. 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?

In this course, achieving learning outcomes is supported through a multifaceted approach that prioritizes both face-to-face communication and engagement in the absence of scheduled contact hours. The course material is structured to encourage interactive learning and active engagement. It includes a mix of lectures, invited speaker sessions, and group discussions during scheduled contact hours to foster face-to-face communication. These sessions allow students to interact with the instructor, ask questions, and engage in real-time discussions related to complex course topics.

In instances where there are no scheduled contact hours, we facilitate student-to-student and student-to-instructor communication through various means:

- Online Discussion Forums: A dedicated online platform on eClass encourages students to interact, ask questions, and discuss course-related topics. This platform serves as an avenue for asynchronous communication, allowing students to engage with peers and the instructor outside of class hours.
- Office Hours: Regularly scheduled office hours provide students with opportunities for one-on-one or small-group discussions with the instructor. This facilitates personalized communication and addresses individual queries, fostering a supportive learning environment.

To encourage active participation and communication, students are encouraged to utilize available resources such as discussion forums, email communication, and virtual meeting platforms. Clear guidelines on communication expectations and prompt responses to queries further support student engagement and foster a sense of community within the course.

EE: Indicate if experiential education strategies will be used in the class.

No.

Mode of Delivery: What is the mode of delivery? (Blended, correspondence, hyFlex, Lab, Lecture, Online....) Lecture.

Enrollment notes: Is the course limited to a specific group of students; closed to a specific group of students; and/or if there is any additional information necessary for student to know before enrolling. The course will be offered to students majoring in Actuarial Science.

Expected Enrollment: Indicate the number of expected student enrolment per academic year of the course. 30.

Please submit completed forms and required supporting documentation by email to the Coordinator, Faculty Governance $-\frac{fgsgovrn@yorku.ca}{fgsgovrn@yorku.ca}$

New Course Proposal Form

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: B.A. Honours and B.A. Specialized Honours in Actuarial Science

2. Course Number: MATH 4283

3. Credit Value: 3.0

4. Long Course Title: Ratemaking Methods for Property & Casualty Insurance

5. Short Course Title: Ratemaking for P&C Insurance

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: Summer 2025

7. Calendar (Short) Course Description:

This is the description of the course as it will appear in the University course repository and related publications. Calendar (short) course descriptions should be written in the present tense and may be a maximum of 60 words. Please include information with respect to any pre-/co-requisites and/or crosslisting or integration in the course description. Please indicate if the language of instruction is other than English.

This is an advanced level course on ratemaking methods and techniques for Property & Casualty (P&C) insurance. This course, combined with MATH 4284, ensures an adequate preparation for Exam 5 of the Casualty Actuarial Society.

Prerequisites: MATH 3131 3.0 and MATH 3330 3.0.

8. Expanded Course Description:

This is the detailed course description that will be published in course outlines, program handbooks, etc. Expand upon the short description in order to give academic approval committees a full and clear sense of the aims and objectives of the course and the types of materials it will cover.

This is an advanced level course on ratemaking methods and techniques for P&C insurance. Topics covered include: ratemaking data, exposures, premium, losses and loss adjustment expenses, other expenses and profits, overall indication, risk classification, credibility, implementation, commercial lines rating mechanisms, and claims-made ratemaking. This course, combined with MATH 4284 ensures an adequate preparation for Exam 5 of the Casualty Actuarial Society.

Prerequisites: MATH 3131 3.0 and MATH 3330 3.0.

9. Course Learning Outcomes

(Necessary for Quality Assurance approval and cyclical program reviews) *What will students be able to do upon completion of this course specifically?*

Upon successful completion of the course, students are expected to meet the following learning objectives related to ratemaking for P&C insurance:

- Define and describe exposure bases as used in the ratemaking process.
- Evaluate and select an exposure base in a given scenario for use in the ratemaking process (e.g., line of business, use cases).
- Aggregate and/or organize ratemaking data in the following ways: calendar year, policy year, accident year, report year, close year, in-force, net of reinsurance.
- Evaluate ratemaking data and analyses for errors and reasonableness.
- Separate data into groups that balance homogeneity and credibility and summarize the considerations for determining such groups.
- Calculate loss and loss adjustment expenses to be used for ratemaking (e.g., common ratios, adjustments to losses, claims-made vs occurrence coverage).
- Calculate various adjustments to the premium used for ratemaking (e.g., on-leveling, premium audit).
- Calculate and apply trends (e.g., exposure, premium, losses) using different approaches (e.g., exponential, and linear analyses).
- Calculate the underwriting provisions underlying the overall rate level indication (e.g., fixed and variable expenses, profit and contingency, reinsurance costs).
- Demonstrate proper handling of extraordinary losses for ratemaking purposes (e.g., large losses, catastrophes).
- Construct an overall rate level indication using the pure premium and loss ratio methods.
- Apply credibility to ratemaking analyses using different methods and justify choice of complement.
- Select and justify a final rate change to implement beyond the calculated overall rate level indication (e.g., Operational/Marketing/Regulatory Constraints, Lifetime Value).
- Perform calculations related to alternative ratemaking procedures (e.g., classification, territory, deductibles, increased limits, coinsurance, commercial lines rating mechanisms, etc.).
- Analyze results of predictive models (e.g., GLM).
- Apply the four principles of ratemaking to a scenario.
- Understand the considerations for implementing rates to achieve an organization's goals (e.g., non-pricing solutions, minimum premium, rating algorithms).

10. Rationale:

Please indicate how the proposed course will contribute to the academic objectives of the program. Please provide a description of the learning outcomes/objects for the course. As well, please indicate the relationship of the proposed course to other existing options, particularly with respect to focus/content/approach. If overlap with other existing courses exists, please indicate the nature and extent of consultation that has taken place. Additionally, please append the graduate program's existing learning outcomes as a separate document.

This course is needed to accomplish the accreditation process of York's Actuarial Science program with the University Recognition Program of the Casualty Actuarial Society.

York aspires, and is now positioned very well, to secure the gold level recognition (this represents the highest level of recognition, see <u>www.casact.org/sites/default/files/2023-11/CAS-University-Recognition-Program.pdf</u> for more details) by the Casualty Actuarial Society. Since York's actuarial program launch in 2017, it has grown into one of the largest undergraduate programs in the Department of Mathematics and Statistics, which let us hire two new faculty members in actuarial science (both faculty members hold professional designations of the Society of Actuaries). It is now time to reap the benefit of the work we have put into our actuarial science program.

The course extensively explores a wide range of subjects related to ratemaking in Property and Casualty (P&C) insurance, effectively bridging the gap between York University's existing actuarial curriculum to the evolving practices found in the P&C industry. This course is distinct from any existing offerings at York University, providing students with essential skills to effectively perform ratemaking for P&C insurance, enabling informed decision-making. Successful completion of the course ensures thorough preparation for the ratemaking part of Exam 5 conducted by the Casualty Actuarial Society.

Recognizing similar courses offered by universities with an esteemed actuarial program like the University of Toronto and the University of Waterloo, introducing this course will augment the competitiveness of York University's Actuarial Science program and enhance the capabilities of its graduates.

11. Evaluation:

Please supply a detailed breakdown of course requirements, including the type and percentage value of each assignment. The expectation is that course assignments can normally be accomplished within the course period. If applicable, details regarding expectations and corresponding grading requirements with respect to attendance and participation should be provided.

The assessments in this course are designed to provide students with hands-on experience in applying theoretical concepts to real-world scenarios, fostering critical thinking, data analysis skills, and practical proficiency in using software tools like R for comprehensive data preparation and statistical analysis within the context of the course topics.

Students will typically complete a series of individual homework assignments and a group assignment. Each individual homework assignment may contain written questions, computation questions, and case studies. The group assignment is expected to involve data preparation and statistical analysis using a software (e.g., R) for a selected course topic. Students will also complete a midterm exam and a final exam.

Individual homework assignment $(6 \times 5\% = 30\%)$ Group assignment (10%) Midterm Exam (20%) Final Exam (40%)

12. Integrated Courses: None.

Graduate courses may be integrated only with undergraduate courses at the 4000-level, where it is understood that 4000-level indicates an advanced level. Graduate students will be expected to do work at a higher level than undergraduates. If the proposed course is to be integrated, please provide a grading scheme that clearly

differentiates between the work that undergraduate and graduate students perform, including a description of how the work performed by graduate students is at a higher level. As well, please indicate the course information for the undergraduate course (i.e., Faculty/unit/course number/credit value) and include a statement from the relevant undergraduate chair or undergraduate director indicating agreement to the integration.

13. Crosslisted Courses: None.

Crosslisted courses are offered between two or more graduate programs. For crosslisted courses, please include a statement of agreement from the director of the other graduate program(s).

14. Faculty Resources:

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.

Primary faculty member: Ed Furman.

Alternative faculty members: Jingyi Cao and Dongchen Li.

The course is expected to be offered on biennial basis. The impact will be the requirement of one faculty member to teach this course. As in the case of other 3^{rd} and 4^{th} year actuarial courses, one weekly tutorial of an hour is required. Ed Furman is expected to teach the course when it is offered for the first time; intended first offering is in Winter 2026.

15. Physical Resources:

Please provide a statement regarding the adequacy of physical resources (equipment, space, labs, etc.), including whether or not additional/other physical resources are required and how the need for these additional/other physical resources will be met.

This course requires a computer lab equipped with statistical software.

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.

Brown, Robert L., and Leon R. Gottlieb. *Introduction to ratemaking and loss reserving for property and casualty insurance*, Fifth Edition, 2022. ACTEX Publications.

Werner, G., and Modlin, C., *Basic Ratemaking*, Casualty Actuarial Society, Fifth Edition, May 2016.

Actuarial Standards Board of the American Academy of Actuaries, "Actuarial Standard of Practice No. 12, Risk Classification (for All Practice Areas)," revised in 2005, updated for deviation language in 2011.

Additional Sections in the Online Form.

Course Design: Indicate how the course design will support students in achieving the learning outcomes. Please detail any aspects of the content, delivery, or learning goals that involve "face-to-face" communication or non-campus attendance. 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?

In this course, achieving learning outcomes is supported through a multifaceted approach that prioritizes both face-to-face communication and engagement in the absence of scheduled contact hours. The course material is structured to encourage interactive learning and active engagement. It includes a mix of lectures and group discussions during scheduled contact hours to foster face-to-face communication. These sessions allow students to interact with the instructor, ask questions, and engage in real-time discussions related to complex course topics.

In instances where there are no scheduled contact hours, we facilitate student-to-student and student-to-instructor communication through various means:

- Online Discussion Forums: A dedicated online platform on eClass encourages students to interact, ask questions, and discuss course-related topics. This platform serves as an avenue for asynchronous communication, allowing students to engage with peers and the instructor outside of class hours.
- Office Hours: Regularly scheduled office hours provide students with opportunities for one-on-one or small-group discussions with the instructor. This facilitates personalized communication and addresses individual queries, fostering a supportive learning environment.

To encourage active participation and communication, students are encouraged to utilize available resources such as discussion forums, email communication, and virtual meeting platforms. Clear guidelines on communication expectations and prompt responses to queries further support student engagement and foster a sense of community within the course.

EE: Indicate if experiential education strategies will be used in the class. No.

Mode of Delivery: What is the mode of delivery? (Blended, correspondence, hyFlex, Lab, Lecture, Online....) Lecture.

Enrollment notes: Is the course limited to a specific group of students; closed to a specific group of students; and/or if there is any additional information necessary for student to know before enrolling. The course will be offered to students majoring in Actuarial Science.

Expected Enrollment: Indicate the number of expected student enrolment per academic year of the course. 20+.

Please submit completed forms and required supporting documentation by email to the Coordinator, Faculty Governance $-\frac{fgsgovrn@yorku.ca}{fgsgovrn@yorku.ca}$

New Course Proposal Form

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: B.A. Honours and B.A. Specialized Honours in Actuarial Science

2. Course Number: MATH 4284

3. Credit Value: 3.0

4. Long Course Title: Reserving Methods for Property & Casualty Insurance

5. Short Course Title: Reserving for P&C Insurance

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: Winter 2026

7. Calendar (Short) Course Description:

This is the description of the course as it will appear in the University course repository and related publications. Calendar (short) course descriptions should be written in the present tense and may be a maximum of 60 words. Please include information with respect to any pre-/co-requisites and/or crosslisting or integration in the course description. Please indicate if the language of instruction is other than English.

This is an advanced level course on reserving methods and techniques for Property & Casualty (P&C) insurance. This course, combined with MATH 4283, ensures an adequate preparation for Exam 5 of the Casualty Actuarial Society.

Prerequisites: MATH 3131 3.0 and MATH 3330 3.0.

8. Expanded Course Description:

This is the detailed course description that will be published in course outlines, program handbooks, etc. Expand upon the short description in order to give academic approval committees a full and clear sense of the aims and objectives of the course and the types of materials it will cover.

This is an advanced level course on reserving methods and techniques for Property & Casualty insurance. Topics covered include introduction to claim processes, information gathering, basic techniques for estimating unpaid claims, and estimating unpaid claim adjustment expenses. This course, combined with MATH 4283, ensures an adequate preparation for Exam 5 of the Casualty Actuarial Society.

Prerequisites: MATH 3131 3.0 and MATH 3330 3.0.

9. Course Learning Outcomes

(Necessary for Quality Assurance approval and cyclical program reviews) *What will students be able to do upon completion of this course specifically?*

Upon successful completion of the course, students are expected to meet the following learning objectives related to reserving for P&C insurance:

- Organize reserving data in the following ways: calendar year, accident year, policy year, underwriting year, report year, etc.
- Evaluate reserving data and analyses for errors and reasonableness.
- Describe the role of homogeneity and credibility of data in the process of estimating unpaid claims.
- Describe the fundamentals of different types of insurance (e.g., long tail versus short tail lines, low frequency versus high frequency lines, occurrence versus claims made).
- Articulate the importance of accurate estimates of unpaid claims.
- Build and analyze development triangles (e.g., loss, count, allocated loss adjustment expenses (ALAE))
- Apply a tail factor.
- Use development triangles as diagnostic tools to identify changes and trends (e.g., loss and claim count, ratio of losses to premium, severity, ratios of loss and claim counts).
- Calculate and evaluate unpaid loss estimation techniques (i.e., development/chain ladder, case outstanding development, expected losses, Bornhuetter-Ferguson, Cape Cod, frequency-severity, Berquist-Sherman, Benktander).
- Assess the influence of operating changes on the estimation of unpaid losses (e.g., claims coding and/or claim-related expenses, claims processing, underwriting and policy provisions, marketing, reinsurance, treatment of recoveries such as deductibles and salvage and subrogation).
- Adjust data and/or estimation techniques for changes in the internal and external environment (e.g., claims processes that result in shift in the adequacy of case outstanding or shift in settlement rates, change in mix of business, change in rate level, inflationary or legal environment).
- Consider the impact of and adjust for the presence of large losses in a reserving analysis.
- Calculate and evaluate the estimation techniques for recoveries (e.g., salvage and subrogation, reinsurance).
- Calculate and evaluate the estimation techniques for allocated loss adjustment expenses.
- Calculate and evaluate the estimation techniques for unallocated loss adjustment expenses.
- Evaluate the results of a reserve analysis for adequacy and reasonableness using loss ratios, severities, pure premiums, frequencies, indicated unpaid losses, etc.
- Monitor results for adequacy and reasonability including interim valuations (e.g., actual versus expected, roll forward analysis).
- Communicate results and drivers of change to various stakeholders (internal management, investors, regulators).
- Define and apply reinsurance concepts to calculate net, ceded, and gross losses.
- Utilize external information in a reserve analysis.

10. Rationale:

Please indicate how the proposed course will contribute to the academic objectives of the program. Please provide a description of the learning outcomes/objects for the course. As well, please indicate the relationship of the proposed course to other existing options, particularly with respect to focus/content/approach. If overlap

with other existing courses exists, please indicate the nature and extent of consultation that has taken place. Additionally, please append the graduate program's existing learning outcomes as a separate document.

This course is needed to accomplish the accreditation process of York's Actuarial Science program with the University Recognition Program of the Casualty Actuarial Society.

York aspires, and is now positioned very well, to secure the gold level recognition (this represents the highest level of recognition, see <u>www.casact.org/sites/default/files/2023-11/CAS-University-Recognition-Program.pdf</u> for more details) by the Casualty Actuarial Society. Since York's actuarial program launch in 2017, it has grown into one of the largest undergraduate programs in the Department of Mathematics and Statistics, which let us hire two new faculty members in actuarial science (both faculty members hold professional designations of the Society of Actuaries). It is now time to reap the benefit of the work we have put into our actuarial science program.

The course extensively explores a wide range of subjects related to reserving in Property and Casualty (P&C) insurance, effectively bridging the gap between York University's existing actuarial curriculum to the evolving practices found in the P&C industry. This course is distinct from any existing offering at York University, providing students with essential skills to effectively perform reserving for P&C insurance, enabling informed decision-making. Successful completion of the course ensures thorough preparation for the reserving part of Exam 5 conducted by the Casualty Actuarial Society (CAS).

11. Evaluation:

Please supply a detailed breakdown of course requirements, including the type and percentage value of each assignment. The expectation is that course assignments can normally be accomplished within the course period. If applicable, details regarding expectations and corresponding grading requirements with respect to attendance and participation should be provided.

The assessments in this course are designed to provide students with hands-on experience in applying theoretical concepts to real-world scenarios, fostering critical thinking, data analysis skills, and practical proficiency in using software tools like R for comprehensive data preparation and statistical analysis within the context of the course topics.

Students will typically complete a series of individual homework assignments and a group assignment. Each individual homework assignment may contain written questions, computation questions, and case studies. The group assignment is expected to involve data preparation and statistical analysis using a software (e.g., R) for a selected course topic. Students will also complete a midterm exam and a final exam.

Individual homework assignment $(6 \times 5\% = 30\%)$ Group assignment (10%) Midterm Exam (20%) Final Exam (40%)

12. Integrated Courses: None.

Graduate courses may be integrated only with undergraduate courses at the 4000-level, where it is understood that 4000-level indicates an advanced level. Graduate students will be expected to do work at a higher level than undergraduates. If the proposed course is to be integrated, please provide a grading scheme that clearly differentiates between the work that undergraduate and graduate students perform, including a description of how the work performed by graduate students is at a higher level. As well, please indicate the course information for the undergraduate course (i.e., Faculty/unit/course number/credit value) and include a statement from the relevant undergraduate chair or undergraduate director indicating agreement to the integration.

13. Crosslisted Courses: None.

Crosslisted courses are offered between two or more graduate programs. For crosslisted courses, please include a statement of agreement from the director of the other graduate program(s).

14. Faculty Resources:

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.

Primary faculty member: Ed Furman.

Alternative faculty members: Jingyi Cao and Dongchen Li.

The course is expected to be offered on biennial basis. The impact will be the requirement of one faculty member to teach this course. As in the case of other 3rd and 4th year actuarial courses, one weekly tutorial of an hour is required. Ed Furman is expected to teach the course when it is offered for the first time; intended first offering is in Winter 2026.

15. Physical Resources:

Please provide a statement regarding the adequacy of physical resources (equipment, space, labs, etc.), including whether or not additional/other physical resources are required and how the need for these additional/other physical resources will be met.

This course requires a computer lab equipped with statistical software.

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.

Brown, Robert L., and Leon R. Gottlieb. *Introduction to ratemaking and loss reserving for property and casualty insurance*, Fifth Edition, 2022. ACTEX Publications.

Friedland, J.F., *Estimating Unpaid Claims Using Basic Techniques*, Casualty Actuarial Society, Third Version, July 2010.

Actuarial Standards Board of the American Academy of Actuaries, "Actuarial Standard of Practice No. 12, Risk Classification (for All Practice Areas)," revised in 2005, updated for deviation language in 2011.

Actuarial Standards Board of the American Academy of Actuaries, "Actuarial Standard of Practice No. 13, Trending Procedures in Property/Casualty Insurance," revised in 2009, updated for deviation language in 2011.

Actuarial Standards Board of the American Academy of Actuaries, "Actuarial Standard of Practice No. 43, Property/Casualty Unpaid Claim Estimates," adopted in 2007, updated for deviation language in 2011.

Statement of Principles Regarding Property and Casualty Insurance Ratemaking, Casualty Actuarial Society, May 1988.

Additional Sections in the Online Form.

Course Design: Indicate how the course design will support students in achieving the learning outcomes. Please detail any aspects of the content, delivery, or learning goals that involve "face-to-face" communication or non-campus attendance. 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?

In this course, achieving learning outcomes is supported through a multifaceted approach that prioritizes both face-to-face communication and engagement in the absence of scheduled contact hours. The course material is structured to encourage interactive learning and active engagement. It includes a mix of lectures and group discussions during scheduled contact hours to foster face-to-face communication. These sessions allow students to interact with the instructor, ask questions, and engage in real-time discussions related to complex course topics.

In instances where there are no scheduled contact hours, we facilitate student-to-student and student-to-instructor communication through various means:

- Online Discussion Forums: A dedicated online platform on eClass encourages students to interact, ask questions, and discuss course-related topics. This platform serves as an avenue for asynchronous communication, allowing students to engage with peers and the instructor outside of class hours.
- Office Hours: Regularly scheduled office hours provide students with opportunities for one-on-one or small-group discussions with the instructor. This facilitates personalized communication and addresses individual queries, fostering a supportive learning environment.

To encourage active participation and communication, students are encouraged to utilize available resources such as discussion forums, email communication, and virtual meeting platforms. Clear guidelines on communication expectations and prompt responses to queries further support student engagement and foster a sense of community within the course.

EE: *Indicate if experiential education strategies will be used in the class.* No.

Mode of Delivery: What is the mode of delivery? (Blended, correspondence, hyFlex, Lab, Lecture, Online....) Lecture.

Enrollment notes: Is the course limited to a specific group of students; closed to a specific group of students; and/or if there is any additional information necessary for student to know before enrolling. The course will be offered to students majoring in Actuarial Science.

Expected Enrollment: Indicate the number of expected student enrolment per academic year of the course. 30.

Please submit completed forms and required supporting documentation by email to the Coordinator, Faculty Governance $-\frac{fgsgovrn@yorku.ca}{fgsgovrn@yorku.ca}$



MEMORANDUM York University Libraries

To: Dongchen Li

From: William Denton (York University Libraries)

Date: 8 December 2023

Subject: Library Statement of Support: MATH 4282 (Mathematics of Life Contingencies 3), MATH 4283 (Ratemaking for Property & Casualty Insurance), MATH 4284 (Reserving for Property & Casualty Insurance)

Summary

This statement covers three proposed courses in the BA in Actuarial Science. York University Libraries (YUL) is well positioned to support them.

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.

Inspecting the bibliographies in the proposals, I was first of all pleased to see that the <u>Actuarial Standards of</u> <u>Practice</u> are freely available online, which is not the case for standards in some other fields. Similarly, Werner and Modlin's <u>Basic Ratemaking</u> and Friedland's <u>Estimating Unpaid Claims Using Basic Techniques</u> are also openly available. Of the remaining materials, our extensive journal holdings have all the articles, we have both MacDonald's <u>Derivatives Markets</u> and <u>Fundamentals of Private Pensions</u> by McGill et al., and I have placed orders for both <u>Actuarial Mathematics for Life Contingent Risks</u> by Dickson and Waters (the third edition, we have previous ones) and <u>Introduction to Ratemaking and Loss Reserving for Property and Casualty Insurance</u> (fifth edition) by Brown and Gottlieb. If there are any other books that would help support the actuarial science program I will be happy to order them, and we can consider requests for new ongoing journal subscriptions.

Historically, textbook publishers have not made their electronic content available for purchase by libraries. This remains an ongoing challenge. Library personnel can assist with locating Open Access alternatives. Furthermore, the Libraries' Open Scholarship department offers <u>support to researchers on digital publishing</u>, open repositories, and Creative Commons licensing.

The Omni single-search interface provides students with access to a wide range of materials, including books, book chapters, articles, dissertations, streaming media, etc. Of particular interest will be material described

with <u>the subject heading Actuarial science</u>. Library users may also request items from partner libraries through Omni. The <u>A-Z list</u> 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 <u>workshops</u>, online <u>research guides</u>, and individual research assistance. Instructors can <u>arrange a research skills workshop</u> (or seminar) geared to a specific assignment, course, or competency.

Research Guides of Interest:

Mathematics

Research Help

Online <u>research assistance</u> is available in both English and French via chat and email. In addition, students and faculty can book <u>one-hour research consultations</u> with a specialist librarian.

Accessibility Services

<u>Library Accessibility Services</u> (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. Contact <u>lashelp@yorku.ca</u> with questions.

Changes to Existing Course

Faculty: Science

Department:	Division of Natural Science, Department of Science, Technology & Society		Date of Submission:	Dec 4, 2023	
Course Number:	NATS1525 3.0		Effective Session:	SU 2025	
Course Title:	Extraterrestrial Life: A Modern Di Cultural Aspects	scussior	to include Historical, F	Religious and	
Type of Change:					
in pre-requisit	e(s)/co-requisite(s)		in cross-listing		
in course number/level			in degree credit exclusion(s)		
in credit value	in credit value		regularize course (from Special Topics)		
in title (max. 40 characters for short title)		X	in course format/mode of delivery *		
in Calendar de	in Calendar description (max. 40 words or 200		_] retire/expire course		
other (please specify):		X	in CCE/NCRs		

Change From:

To:

Course Description: Explores the history of	Course Description : Explores the history of
humankind's search for life beyond Earth. With an	humankind's search for life beyond Earth.
introduction to the beliefs of ancient Greeks, we will	With an introduction to the beliefs of
embark on a journey to explore the ideas of many	ancient Greeks, we will embark on a journey
famous scientists such as Galileo, Kepler, Newton and	to explore the ideas of many famous
Darwin on the existence of extraterrestrials. We will then	scientists such as Galileo, Kepler, Newton
examine some of the interesting topics that have	and Darwin on the existence of
resurfaced in the field of science and religion following	extraterrestrials. We will then examine
the recent discoveries in the fields of exoplanetary	some of the interesting topics that have
science and astrobiology. We will explore the spectrum	resurfaced in the field of science and
of modern positions of different religions with regard to	religion following the recent discoveries in
a potential discovery of extraterrestrial life. Finally, we	the fields of exoplanetary science and
will discuss some of the cultural, political and	astrobiology. We will explore the spectrum
sociological aspects of a discovery of extraterrestrial life.	of modern positions of different religions
Course credit exclusions: SC/NATS 1880 6.00, SC/NATS	with regard to a potential discovery of
1745 6.00.	extraterrestrial life. Finally, we will discuss
	some of the cultural, political and
Delivery Format: LECT	sociological aspects of a discovery of

Delivery Format: LECT, BLEN

Rationale:

CCEs: The list of topics for NATS1525 Extraterrestrial Life, NATS1880 Life Beyond Earth and NATS1745 History of Astronomy have been reviewed and are found to have insufficient overlap to justify a CCE. Moreover, a CCE with NATS1525 was never reciprocated for NATS1880 and NATS1745. The expanded course descriptions for all 3 courses are provided below.

NATS1525 3.0 Extraterrestrial Life:

This course is an examination of the history of humankind's search for life beyond Earth as a prime example of the interaction between science and religion. With an introduction to the beliefs of ancient Greeks, this class embarks the students on a journey to explore how these ideas influenced the position of early Christians on the issue of plurality of the worlds. The role of condemnations of 1277 along with the Copernican revolution in gradually leading to the revision of earlier convictions and eventually resulting in a widespread belief in the abundance of intelligent life in the universe is investigated. To this end, the views of Galileo, Kepler Huygens, Newton, Voltaire, Paine, Gauss, Darwin, Tesla and many others are examined. A number of historical novels, such as Kepler's Somnium and Voltaire's Micromegas with extraterrestrial themes are explored. The development of the rare Earth hypothesis in the 19th century, as a religious response to the strongly anti Christians objections based on the plurality of the worlds, is examined. This historical examination will be complemented with a discussion of the resurfacing of a number of these objection s following the recent discoveries of thousands of exoplanets.

NATS1745 6.0 History of Astronomy:

This course follows the evolution of discoveries and theories about Astronomy from pre-historic times up to the present. We begin by looking at ancient sites where we find evidence that the motions of the Sun and stars were understood in prehistoric times. We then look at the astronomical knowledge amassed by ancient civilizations such as the Mayans, Babylonians and Egyptians, followed by the Greek explanations for the cosmos and the beginnings of Astronomy as a science. The first half of the course concludes with the early history of modern Astronomy and covers figures like Copernicus, Brahe, Kepler, Galileo and Newton. The 2nd half of the course covers discoveries about our solar system, the stars, galaxies and the universe from the 19th century up to the present day. This includes the history of our missions to space, recent discoveries about the birth and evolution of the universe, discoveries of new planets beyond our solar system, and theories about black holes, dark matter and dark energy.

NATS1880 6.0 Life Beyond Earth:

In NATS 1880, Life Beyond Earth, students will be able to describe and explain how science works, the nature of and conditions for life on Earth, sites where life may be found in our solar system and in extrasolar systems, how best to detect intelligent life in our Galaxy and how humankind would react if an intelligent civilization were discovered.

Delivery format: A goal of the <u>Faculty of Science Strategic Plan 2021-2025</u> is to "optimize online and blended in-person/online courses and programs to diversify learning", where the blended format is <u>defined by the Registrar's Office</u> as a "combination of virtual and in-person learning; instructor will define whether virtual components are synchronous or asynchronous." This format is suggested as a solution for balancing the diverse needs of commuting students and faculty with the benefits of in-person learning and maintaining a strong on-campus community. In addition, according to <u>A Case for Change: eLearning Integration at York University - Summary and Recommended Actions</u>, prepared by York's Academic Technology Advisory Group, the literature shows "when compared to fully online and face-to-face, blended learning has been shown to have higher success rates and lower withdrawal rates." As such, in the recent report from the <u>Joint APPRC-ASCP Task Force on the Future of Pedagogy</u>, a preliminary recommendation is to "consider expanding and enhancing blended learning at York so that it becomes a more common mode of delivery". While the report also recommends that the first-year experience should be primarily delivered in-person, approximately 40% of NATS students complete their NATS gen-ed requirement in their 2nd, 3rd or 4th year.

In-person learning in NATS courses can be uniquely valuable in that it creates opportunities for students to make connections outside of their programs. However, students tend to choose their NATS courses after their core courses are already scheduled, leaving limited scheduling windows for NATS LECT courses. Based on the 1,937 course evaluations received from the ~8500 students who completed a NATS course in the FW2022-23 session, approximately 20% of NATS students chose their NATS course because it fit their timetable, and nearly half of those students enrolled in online courses. Thus, by offering more NATS courses in the blended format, we increase the likelihood of students enrolling in courses of their chosen subject area as well as courses which contain an in-person component.

At present, NATS has only 6 of 58 active courses in the blended format. Three of these are in the life sciences and 3 are in the physical sciences. We would therefore like to expand our blended course offerings in number as well as in breadth.

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 learning in the absence of substantial on-campus attendance.	In the LECT format, NATS1525 achieves its learning objectives by a combination of in-person lecture material, in-class active learning exercises (clicker quizzes and group discussions), homework assignments and a final project. The BLEN format will follow the same model, with the exception that at least 50% of class time will be delivered online and synchronously, providing learners with the flexibility of completing at least 50% of the course without having to come to campus. During the online synchronous classes, active learning exercises will be accomplished using online tools (iClicker, zoom breakout rooms, shared Google documents, etc.) In both formats, the assessment scheme will remain the same and tests and final exams will be completed in person.
on-campus attendance.	
 Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.). Number of department members currently competent to teach the course. Instructor(s) likely to teach the course in the coming year. 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. 	 Summer, Fall and Winter terms. Going forward, it will be offered in the BLEN format in the SU term, with all lectures held online and synchronously. This will enable students to complete the course remotely during the summer term. In the Fall or Winter terms, NATS1525 will be offered in either the LECT or BLEN format, depending on the number of LECT, BLEN, and ONLN/ONCA courses offered each year. When offered in the BLEN format in the Fall or Winter terms, approximately 50% of the classes will be held in person. There are 5 faculty members with the expertise to teach this course. Parandis Tajbakhsh is expected to be teaching this course in SU25 and FW25-26. The number of learning hours for NATS1525 LECT is as follows: 36 hours in-person lectures and active learning exercises (3 hrs x 12 wks) 8 hours reading assignments (1 hr x 8 wks)
	 The total number of learning hours will remain the same for NATS1525 BLEN, as follows: 36 hours lectures and active learning exercises, either in person or in online synchronous format (3 hrs x 12 wks) 8 hours reading assignments (1 hour x 8 weeks)

Changes to Existing Course

Faculty: Science

Department:	Division of Natural Science, Department of Science, Technology & Society		Date of Submission:	Dec 4, 2023
Course Number:	NATS1550 3.0		Effective Session:	FW 25-26
Course Title:	Animal Migration			
Type of Change:				
in pre-requisit	e(s)/co-requisite(s)		in cross-listing	
in course num	ber/level		in degree credit exclusion(s)	
in credit value			regularize course (fro	om Special Topics)
in title (max. 4	0 characters for short title)	X	in course format/mo	de of delivery *
in Calendar de	escription (max. 40 words or 200		retire/expire course	
other (please	specify):		in CCE/NCRs	
Change From:		To:		
LECT		LEC	Γ, BLEN	

Rationale:

A goal of the <u>Faculty of Science Strategic Plan 2021-2025</u> is to "optimize online and blended inperson/online courses and programs to diversify learning", where the blended format is <u>defined by the</u> <u>Registrar's Office</u> as a "combination of virtual and in-person learning; instructor will define whether virtual components are synchronous or asynchronous." This format is suggested as a solution for balancing the diverse needs of commuting students and faculty with the benefits of in-person learning and maintaining a strong on-campus community. In addition, according to <u>A Case for Change: eLearning</u> <u>Integration at York University - Summary and Recommended Actions</u>, prepared by York's Academic Technology Advisory Group, the literature shows "when compared to fully online and face-to-face, blended learning has been shown to have higher success rates and lower withdrawal rates." As such, in the recent report from the <u>Joint APPRC-ASCP Task Force on the Future of Pedagogy</u>, a preliminary recommendation is to "consider expanding and enhancing blended learning at York so that it becomes a more common mode of delivery". While the report also recommends that the first-year experience should be primarily delivered in-person, approximately 40% of NATS students complete their NATS gen-ed requirement in their 2nd, 3rd or 4th year. In-person learning in NATS courses can be uniquely valuable in that it creates opportunities for students to make connections outside of their programs. However, students tend to choose their NATS courses after their core courses are already scheduled, leaving limited scheduling windows for NATS LECT courses. Based on the 1,937 course evaluations received from the ~8500 students who completed a NATS course in the FW2022-23 session, approximately 20% of NATS students chose their NATS course because it fit their timetable, and nearly half of those students enrolled in online courses. Thus, by offering more NATS courses in the blended format, we increase the likelihood of students enrolling in courses of their chosen subject area as well as courses which contain an in-person component.

At present, NATS has only 6 of 58 active courses in the blended format. Three of these are in the life sciences and 3 are in the physical sciences. We would therefore like to expand our blended course offerings in number as well as in breadth.

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:	In the LECT format, NATS1550 achieves its learning objectives by a		
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?	combination of in-person lecture material, in-class active learning exercises (clicker quizzes, peer-to-peer discussion and group problem- solving activities), and pre-class preparatory assignments. The BLEN format will follow the same model, with the exception that the lecture material will be delivered online and asynchronously, providing diverse learners with the flexibility of completing the lecture material at their own pace.		
Detail any aspects of the content, delivery, or learning goals that involve "face-to-face" communication, non-campus attendance or experiential education components.	In both formats, the assessment scheme will remain the same and midterm tests and a final exam will be completed in person.		
Alternatively, explain how the course design encourages student engagement and supports student learning in the absence of substantial on-campus attendance.			
 Instruction: Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.). 	 NATS1550 is currently offered in the LECT format once in the Fall term and once in the Winter term. Going forward, we plan to offer it in the BLEN format in either one or both terms, depending on the number of LECT, BLEN, and ONLN/ONCA courses offered each year. 		
2. Number of department members currently competent to teach the course.	2. At present, there are 4 faculty members with the expertise to teach this course.		
3. Instructor(s) likely to teach the course in the coming year.	3. Birgit Schwarz is expected to be teaching this course in FW25-26.		
 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 	 4. The number of learning hours for NATS1550 LECT is as follows: 36 hours in-person lectures and active learning exercises (3 hrs x 12 wks) 8 hours of exercises to prepare students for in-class activities (1 hr x 8 wks) The total number of learning hours will remain the same for 		
activities required by the course.	 NATS1550 BLEN, as follows: 18 hours in-person active learning exercise (1.5 hrs x 12 wks) 18 hours of asynchronous lecture material (1.5 hrs x 12 wks) 8 hours of exercises to prepare students for in-class activities (1 hour x 8 weeks) 		

Changes to Existing Course

Faculty: Science

Depa	rtment:	Division of Natural Science, Department of Science, Technology & Society		Date of Submission:	Dec 4, 2023
Cours	se Number:	NATS1575 3.0		Effective Session:	SU 2025
Cours	se Title:	Forensic Science – An Introductio	on		
Туре	of Change:				
	in pre-requisit	e(s)/co-requisite(s)		in cross-listing	
	in course num	ber/level		in degree credit excl	usion(s)
	in credit value			regularize course (fro	om Special Topics)
X	in title (max. 4	0 characters for short title)	X	in course format/mo	de of delivery *
	in Calendar de	escription (max. 40 words or 200		retire/expire course	
	other (please s	specify):		in CCE/NCRs	
Chai	nge From:		To:		
Title	: Forensic Scien	nce – an Introduction	Title: Introduction to Forensic Science		
Deliv	very format: LE	CT, ONLN, ONCA	Delivery format: LECT, ONLN, ONCA, BLEN		

Rationale:

Course Title: The title change is a minor grammatical modification that is more consistent with titles of other NATS courses.

Delivery Format: A goal of the <u>Faculty of Science Strategic Plan 2021-2025</u> is to "optimize online and blended in-person/online courses and programs to diversify learning", where the blended format is <u>defined by the Registrar's Office</u> as a "combination of virtual and in-person learning; instructor will define whether virtual components are synchronous or asynchronous." This format is suggested as a solution for balancing the diverse needs of commuting students and faculty with the benefits of in-person learning and maintaining a strong on-campus community. In addition, according to <u>A Case for</u> <u>Change: eLearning Integration at York University - Summary and Recommended Actions</u>, prepared by York's Academic Technology Advisory Group, the literature shows "when compared to fully online and face-to-face, blended learning has been shown to have higher success rates and lower withdrawal rates." As such, in the recent report from the <u>Joint APPRC-ASCP Task Force on the Future of Pedagogy</u>, a preliminary recommendation is to "consider expanding and enhancing blended learning at York so

that it becomes a more common mode of delivery". While the report also recommends that the firstyear experience should be primarily delivered in-person, approximately 40% of NATS students complete their NATS gen-ed requirement in their 2nd, 3rd or 4th year.

In-person learning in NATS courses can be uniquely valuable in that it creates opportunities for students to make connections outside of their programs. However, students tend to choose their NATS courses after their core courses are already scheduled, leaving limited scheduling windows for NATS LECT courses. Based on the 1,937 course evaluations received from the ~8500 students who completed a NATS course in the FW2022-23 session, approximately 20% of NATS students chose their NATS course because it fit their timetable, and nearly half of those students enrolled in online courses. Thus, by offering more NATS courses in the blended format, we increase the likelihood of students enrolling in courses of their chosen subject area as well as courses which contain an in-person component.

At present, NATS has only 6 of 58 active courses in the blended format. Three of these are in the life sciences and 3 are in the physical sciences. We would therefore like to expand our blended course offerings in number as well as in breadth.

* 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.

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.

Course Design:	In the LECT format, NATS1575 achieves its learning objectives by a
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.	combination of in-person lecture material, in-class active learning exercises (clicker quizzes, group discussions and case studies), reading assignments and a final report. The BLEN format will follow the same model, with the exception that at least 50% of class time will be delivered online and synchronously, providing learners with the flexibility of completing at least 50% of the course without having to come to campus. During the online synchronous classes, active learning exercises will be accomplished using online tools (iClicker, zoom breakout rooms, shared Google documents, etc.) In both formats, the assessment scheme will remain the same and midterm and final exams will be completed in person.
Alternatively, explain how the course design encourages student engagement and supports student learning in the absence of substantial on-campus attendance.	
Instruction:	1. NATS1575 is currently offered in the LECT format once in either the
 Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.). Number of department members currently competent to teach the course. Instructor(s) likely to teach the course in the coming year. 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. 	 Fall or Winter terms and in the ONCA format in the SU term. Going forward, it will be offered in the BLEN format in the SU term instead of ONCA, with all lectures held online and synchronously. This will enable students to complete the course remotely during the summer term. In the Fall or Winter terms, NATS1575 will be offered in either the LECT or BLEN format, depending on the number of LECT, BLEN, and ONLN/ONCA courses offered each year. When offered in the BLEN format in the Fall or Winter terms, approximately 50% of the classes will be held in person. 2. There is 1 faculty member with the expertise to teach this course. 3. Rajeshwari Iyer is expected to be teaching this course in SU25 and FW25-26. 4. The number of learning hours for NATS1575 LECT is as follows: 36 hours in-person lectures and active learning exercises (3 hrs x 12 wks) 8 hours reading assignments (1 hr x 8 wks) The total number of learning hours will remain the same for NATS1575 BLEN, as follows:
	 36 hours lectures and active learning exercises, either in person or in online synchronous format(3 hrs x 12 wks) 8 hours reading assignments (1 hr x 8 wks)

Changes to Existing Course

Faculty: Science

		-		
Department:	Division of Natural Science, Department of Science, Technology & Society		Date of Submission:	Dec 4, 2023
Course Number:	NATS1680 6.0		Effective Session:	SU 2025
Course Title:	The Genetic Revolution			
Type of Change:				
in pre-requisit	e(s)/co-requisite(s)		in cross-listing	
in course num	ber/level		in degree credit excl	usion(s)
in credit value			regularize course (fro	om Special Topics)
in title (max. 4	0 characters for short title)	X	in course format/mo	de of delivery *
in Calendar de	escription (max. 40 words or 200		retire/expire course	
other (please s	specify):		in CCE/NCRs	
Change From:		To:		
LECT		LEC1	, BLEN	

Rationale:

A goal of the <u>Faculty of Science Strategic Plan 2021-2025</u> is to "optimize online and blended inperson/online courses and programs to diversify learning", where the blended format is <u>defined by the</u> <u>Registrar's Office</u> as a "combination of virtual and in-person learning; instructor will define whether virtual components are synchronous or asynchronous." This format is suggested as a solution for balancing the diverse needs of commuting students and faculty with the benefits of in-person learning and maintaining a strong on-campus community. In addition, according to <u>A Case for Change: eLearning</u> <u>Integration at York University - Summary and Recommended Actions</u>, prepared by York's Academic Technology Advisory Group, the literature shows "when compared to fully online and face-to-face, blended learning has been shown to have higher success rates and lower withdrawal rates." As such, in the recent report from the <u>Joint APPRC-ASCP Task Force on the Future of Pedagogy</u>, a preliminary recommendation is to "consider expanding and enhancing blended learning at York so that it becomes a more common mode of delivery". While the report also recommends that the first-year experience should be primarily delivered in-person, approximately 40% of NATS students complete their NATS gen-ed requirement in their 2nd, 3rd or 4th year. In-person learning in NATS courses can be uniquely valuable in that it creates opportunities for students to make connections outside of their programs. However, students tend to choose their NATS courses after their core courses are already scheduled, leaving limited scheduling windows for NATS LECT courses. Based on the 1,937 course evaluations received from the ~8500 students who completed a NATS course in the FW2022-23 session, approximately 20% of NATS students chose their NATS course because it fit their timetable, and nearly half of those students enrolled in online courses. Thus, by offering more NATS courses in the blended format, we increase the likelihood of students enrolling in courses of their chosen subject area as well as courses which contain an in-person component.

At present, NATS has only 6 of 58 active courses in the blended format. Three of these are in the life sciences and 3 are in the physical sciences. We would therefore like to expand our blended course offerings in number as well as in breadth.

* 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.

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.

Course Design:	In the LECT format, NATS1680 achieves its learning objectives by a	
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?	combination of in-person lecture material, in-person assessments and class participation. The BLEN format will follow the same model, with the exception that 50% of the course material will be delivered online and asynchronously, providing learners with the flexibility of completing 50% of the course at their own pace. In the BLEN format:	
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.	 Lectures and discussions will be delivered in two different mode First, students need to cover the relevant pre-recorded lecture of 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. 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 discussio and collaborative material creation (eg, Wiki). 	
 Instruction: Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.). 	1. NATS1680 is currently offered in the LECT format in the combined FW term. Going forward, it will be offered in either the LECT or BLEN format, depending on the number of LECT, BLEN, and ONLN/ONCA courses offered each year.	
 Number of department members currently competent to teach the course. Instructor(s) likely to teach the course in the coming year. 	 There is 1 faculty member with the expertise to teach this course. Mordechay Anafi is expected to be teaching this course in SU25 and FW25-26. 	
 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 	 4. The number of learning hours for NATS1680 LECT is as follows: 72 hours in-person lectures (3 hrs x 24 wks) 24 hours of optional in-person tutorial discussion (1 hr x 12 wks) The total number of learning hours will remain the same for NATS1680 BLEN, as follows: 	
activities required by the course.	 36 hours in-person discussion (1.5 hrs x 24 wks) 36 hours of asynchronous lecture material (1.5 hrs x 24 wks) 24 hours of optional online forum discussion (1 hr x 24 wks) 	

Changes to Existing Course

Faculty: Science

Department:	Division of Natural Science, Department of Science, Technology & Society		Date of Submission:	Dec 4, 2023
Course Number:	NATS1920 6.0		Effective Session:	SU 2025
Course Title:	Great Mathematical Minds			
Type of Change:				
in pre-requisit	e(s)/co-requisite(s)		in cross-listing	
in course num	ber/level		in degree credit excl	usion(s)
in credit value			regularize course (fro	om Special Topics)
in title (max. 4	0 characters for short title)	X	in course format/mo	de of delivery *
in Calendar de	escription (max. 40 words or 200		retire/expire course	
other (please	specify):		in CCE/NCRs	
Change From:		To:		
LECT, ONCA		LEC1	, ONCA, BLEN	

- , - -

Rationale:

A goal of the <u>Faculty of Science Strategic Plan 2021-2025</u> is to "optimize online and blended inperson/online courses and programs to diversify learning", where the blended format is <u>defined by the</u> <u>Registrar's Office</u> as a "combination of virtual and in-person learning; instructor will define whether virtual components are synchronous or asynchronous." This format is suggested as a solution for balancing the diverse needs of commuting students and faculty with the benefits of in-person learning and maintaining a strong on-campus community. In addition, according to <u>A Case for Change: eLearning</u> <u>Integration at York University - Summary and Recommended Actions</u>, prepared by York's Academic Technology Advisory Group, the literature shows "when compared to fully online and face-to-face, blended learning has been shown to have higher success rates and lower withdrawal rates." As such, in the recent report from the <u>Joint APPRC-ASCP Task Force on the Future of Pedagogy</u>, a preliminary recommendation is to "consider expanding and enhancing blended learning at York so that it becomes a more common mode of delivery". While the report also recommends that the first-year experience should be primarily delivered in-person, approximately 40% of NATS students complete their NATS gen-ed requirement in their 2nd, 3rd or 4th year. In-person learning in NATS courses can be uniquely valuable in that it creates opportunities for students to make connections outside of their programs. However, students tend to choose their NATS courses after their core courses are already scheduled, leaving limited scheduling windows for NATS LECT courses. Based on the 1,937 course evaluations received from the ~8500 students who completed a NATS course in the FW2022-23 session, approximately 20% of NATS students chose their NATS course because it fit their timetable, and nearly half of those students enrolled in online courses. Thus, by offering more NATS courses in the blended format, we increase the likelihood of students enrolling in courses of their chosen subject area as well as courses which contain an in-person component.

At present, NATS has only 6 of 58 active courses in the blended format. Three of these are in the life sciences and 3 are in the physical sciences. We would therefore like to expand our blended course offerings in number as well as in breadth.

* 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.

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.

In the LECT format, NATS1920 achieves its learning objectives by a
combination of in-person lecture material, mathematical problem sets and online quizzes. In the ONCA format, lectures are delivered online and asynchronously, in addition to a fortnightly synchronous online session for mathematical problem solving. The BLEN format will follow a similar model as the ONCA format, with the exception that mathematical problem-solving will be done during weekly in-person sessions. This will enable learners to get real-time assistance from the instructor as well as from their classmates, while providing learners with the flexibility of completing 50% of the course material at their own pace. In both formats, the assessment scheme will remain the same and midterm and final exams will be completed in person.
1. NATS1920 is currently offered annually in the ONCA format in the
combined FW term. Going forward, it will be offered annually in the BLEN format.
 There are 2 faculty members with the expertise to teach this course. Carly Rozins is expected to be teaching this course in FW25-26.
 4. The number of learning hours for NATS1920 ONCA is as follows: 54 hours asynchronous online lectures (1.5-3 hrs x 24 wks)
 18 hours synchronous online problem-solving (1.5 hrs x 12 wks)



Memorandum

То:	FSc Department Chairs
From:	Robin Metcalfe, Chair, FSc Undergraduate Curriculum Committee
Date:	Jan 15, 2024
Subject:	New information required by FSc Curriculum for course changes involving online delivery

Dear FSc Deparment Chairs,

The FSc Undergraduate Curriculum Committee is in the process of updating the *New Course Proposal Form* and *Change in Existing Course Form*. The purpose of the updates is to provide the committee members with the information needed to ensure that different delivery formats are reasonably consistent with each other in terms of assessment expectations and integrity.

Specifically, on Dec 21 2023, the Committee passed a motion to request that proposals for course changes involving components of online delivery must include, in the Course Design section, the following information:

- A percentage breakdown and brief description of the course assessments
- For online assessments, a statement(s) to indicate how the integrity of learning evaluation will be maintained

This brings the *Change in Existing Course Form* into alignment with the *New Course Proposal Form*, which already requires this information.

The Committee will be reviewing other changes to the forms in the coming months and seeking consultation from the other faculties in order to incorporate all amendments into new forms. If you have any questions, requests or suggestions, please let me know so I can raise them for discussion. In the meantime, please circulate this memo to your UPDs and others involved in curriculum changes as this will enable us to approve curriculum changes more promptly.





Faculty of Science

YSciCore BioAnalytical Facility

Evaluation and Recomendations January 2024 Part of my mandate as the Associate Dean Research and Partnerships was to conduct an evaluation of FSc YSciCore and make recommendations on improving its sustainability and value to researchers. This evaluation and report was prepared by Vivian Saridakis (Associate Dean Research and Partnerships) in consultation with Brad Sheeler (Director, Safety and Business Operations), Jonathan Cevallos (Infrastructure & Research Facility Manager) and Jerusha Lederman (Director Research and Partnerships).

A. SUMMARY

YSciCore is the BioAnalytical Facility established in 2018 by York University's Faculty of Science (FSc) and located in the Life Sciences Building (LSB). The overarching objective to establishing YSciCore was of supporting scientific excellence of researchers and their research programs. Its establishment was led by Professor Derek Wilson (Chemistry) with the support of former Dean Ray Jayawardhana. YSciCore was created based on existing bioanalytical research support models at other Canadian post-secondary institutions. It was recognized that this kind of Facility would allow FSc researchers to dedicate more time to research activities and have direct access to core state-of-the-art technical facilities. Apart from the provision of the technical services described below, one of YSciCore's main goals was to enhance success in securing external grant funding by enabling internal and external collaborations. The overarching objective and the collaboration goal have been basically achieved over the 5 years in which YSciCore has been in existence, however there are issues on economic viability and sustainability of the facility due to current inabilities in management and cost offsetting functions.

The three main areas of research support provided by YSciCore include mass spectrometry, nuclear magnetic resonance spectroscopy as well as advanced light and electron microscopy (Appendix A). Each of these areas is led by full-time specialists (Maxime Rossatto, Magdalena Jaklewicz and Howard Hunter). These specialists are responsible for maintaining and operating the equipment and specialized instrumentation within the Facility.

The implementation of YSciCore in 2018 was seen to be relatively uncomplicated as two of the specialists were already in place along with the required instruments. The missing components were a facility manager and a mass spectrometry specialist. To ensure that YSciCore would be a sustainable and economically viable initiative, its structure was put in place in the form of ongoing support and commitment by the Faculty of Science with the help of strategic funding from the Provost for salaries. A system for recuperating some of the Facility's costs based on user fee charges was established. Unfortunately, although YSciCore was recognized as a very valuable resource by researchers, the resource supports, fees and costs required to manage, maintain and operate such a facility were grossly underestimated in the initial proposal. The Faculty of Health and Lassonde School of Engineering were not able to support YSciCore when approached. As it currently stands, FSc bears the majority of the costs needed to manage and run the facility (manager, specialists and repairs). The user fees are insufficient to provide anything more than covering a few repairs and in some instances are insufficient to cover the costs of running and maintaining the infrastructure.

Despite the existing management and operational drawbacks, YSciCore is an important facility that is still needed now and in the future for researchers since it provides necessary technical supports and resources and is a catalyst for internal and external collaborations in many fields of life sciences and engineering research. An upgrade or replacement of the core infrastructure will infuse YSciCore with new life and energy and with the development of a more sustainable management, operations and cost-sharing model, YSciCore will add more value than it has in the past and be a huge economically viable benefit to researchers within the Faculties of Science, Health and the Lassonde School of Engineering as originally intended. Recommendations have been made to allow for a new model for the facility and there will be a launch of the updated and renewed YSciCore in the near future.

B. EVALUATION

1. Background

YSciCore is located in York's Life Sciences Building (LSB) and was funded from a strategic investment of \$84 million dollars by York University and the Canadian government through its Knowledge Infrastructure Program (KIP). During the construction phase, the decision was made to purchase cutting edge research equipment to advance the research programs of the faculty members moving into the new building. This new equipment included all of the components (NMR spectrometer, Orbitrap mass spectrometer, scanning electron microscope, laser scanning and spinning disk confocal microscopes) of what would eventually become YSciCore (Appendix A). The investment from York University and LSB building funds to purchase this equipment was approximately \$4.5 million dollars. This investment was regarded as highly beneficial to York and was intended to support and promote research intensification and collaboration not only within York but also regionally and nationally. It was also evident that this equipment would be attractive for industrial partners who would be willing to pay for usage on a fee for service basis. All of this would lead to increased productivity and grant funding for researchers in the Faculty of Science and Engineering as well as the Faculty of Health. It was initially named the LSB Core Facility.

Although the benefits of acquiring this equipment and creating the LSB Core Facility were obvious, the problems with managing and operating them surfaced early. Firstly, in the absence of dedicated support staff (or specialists as they are now known), the equipment was prone to being misused or damaged by inexperienced users. Secondly, the early governance model which was that there would be a responsible researcher who would provide oversight, management and training, was not working as researchers were busy with their own research programs and unable to provide the much needed oversight. FSc stepped in and provided support for some of the equipment as there were, at this stage, research technicians on staff who were responsible for the microscopes in biology (Karen Rethoret) and the NMRs in chemistry (Howard Hunter). Their job responsibilities were modified by FSc to include the management and oversight of newly acquired equipment in LSB. They were not however responsible for the mass spectrometer. Professor Derek Wilson requested support from FSc to hire a mass spectrometer operator and was provided with up to \$10,000 per year. The rest of the monetary support needed for this salary came from individual faculty members that were using the equipment.

2. The LSB Core Facility

The LSB Core Facility existed between 2012 and 2018 however apart from what was noted in the Background section, there is very little formal information regarding its governance, usage, revenue etc. During this time, there were several efforts to develop a system to support this research facility including collecting annual user fees rather than a fee per sample/time. There were initiatives to identify all shared research equipment that could be instrumental in future FSc research success. The plan was to permit FSc researchers access to this equipment at a highly subsidized rate while at the same time charging external clients a lot more. The anticipation was that the external users would utilize excess capacity on the equipment while at the same time generating fees that could be used to sustain the facility. These plans were never fully materialized due to a variety of reasons. Over the years there were sustained efforts to move in this direction.

3. YSciCore's Lack of a Governance Model

Although YSciCore was established in 2018, its governance was not. There was some discussion at the time that a manager would be hired to oversee YSciCore and the specialists along with some other tasks in research intensification and training. This manager was supposed to also develop a business plan for the long-term sustainability of this critical facility. A faculty member was also supposed to oversee the overall management of the YSciCore but this was never initiated. Professor Derek Wilson was involved in the establishment of the facility but not in its management nor operation.

A business plan was to be developed with the goal of becoming self-sustainable. As was the case with the development plans considered for the LSB Core Facility, some of the early ideas were to charge fees for use of equipment, to bring in external users who would pay higher fees, to charge for training and to provide workshops. Operating and maintenance budgets were prepared but it became evident that user fees alone would never cover the costs. The idea to hire a manager was abandoned due to cost and management responsibilities were added to the Director of Research and Partnership's role, then Margaret Hough, who already had a very heavy workload.

4. Equipment Issues

Extended warranties and/or service contracts were purchased in 2011-2012 at a cost of over \$650,000 for most of the equipment. All of these, however, had expired by 2015 and there was absolutely no funding available to renew any of them. Repairs should have been addressed by the business plan which unfortunately had not been developed. To make matters worse, repairs to this specialized equipment could be quite costly but no plans were in place to cover them.

5. Survey Results

The survey was done in April 2023. A total of 33 researchers filled out the survey. Results from the survey are provided in Appendix B. Many of the respondents indicated that they used the core facilities at UofT/UHN/Sickkids due to more consistent results and faster turnaround. There is room for improvement if YSciCore will become the core facility of choice for FSc researchers. Researchers that are performing their experiments at other facilities represent a huge market that should be recaptured with the relaunch of the new and improved YSciCore.

C. RECOMMENDATIONS

1. Governance, Management and Operations

In order to be successful and to meet the needs of researchers in the Faculties of Science, Health and the Lassonde School of Engineering, YSciCore needs to implement all recommendations made as quickly as possible. In the absence of this YSciCore evaluation, FSc would no longer be able to afford to continue the operation and management of the equipment as there never was nor is there now a process in place to make YSciCore and its assets sustainable. Evaluations have shown that the equipment is approaching end of life or already obsolete and requiring significant repairs or

upgrades to keep them in functional condition. The user fees charged to date were not sufficient to cover the repairs or upgrades. The downtime in having repairs/replacements done, is delaying the research programs of the faculty members who rely on them.

YSciCore is still a very much needed technical support facility which is recognized by researchers and administrators as a shared resource that adds value to research in several York Faculties. From past experience, it is clear that for this facility to endure and be self-sustaining, a sound, feasible and proactive governance model is essential and must absolutely be developed. The key recommendation therefore is for governance to be implemented in a transparent and collegial manner. There are specific recommendations in Appendix C regarding the new governance model. To begin with, an Advisory Board or Governing Committee must be set up immediately with a clear mandate and mission statement. This Board/Committee will be tasked with overseeing the governance of YSciCore from initial setup and beyond and will meet at least annually. It will be made up of FSc researchers, the Associate Dean Research and Partnerships, the Director of Research and Partnerships, the Director of Safety and Business Operations, the Executive Officer and one of the three YSciCore specialists on an annual rotating basis. There will also be three sub-committees representing the three main research areas i.e. NMR, Microscopy and MS. The microscopy sub-committee will also have representatives from the Faculty of Health & Lassonde School of Engineering. Each of the specialists will sit on these committees.

The annual meeting of the Advisory Board must include updates on operations including usage and repairs from the each of the specialists. Additionally, the specialists must provide annual reports that include detailed usage, users and income to their manager which must be shared with the ADRP and DRP.

The Board/Committee will look at the YSciCore evaluation (this report) and begin their task of implementing the recommendations towards oversight, management, operations and sustainability, of the facility as described in Appendix C. Some of these recommendations include developing a user agreement, increase user fees, establish tiered fees, add more equipment from LSB, FARQ or CHEM and establish a policy to add new equipment. Some new equipment was in 2023 (Octet BLI, Aurora Flow Cytometer, timsTOF MS and ZenoTOF MS). It is not clear whether this new equipment is being tracked in terms of usage and users and whether fees are being charged.

There are a number of recommendations to improve the day-to-day operations of YSciCore (Appendix C). These recommendations include appointing an Academic Director or Special Advisor to the Dean on YSciCore who will be responsible for the overall direction of YSciCore. Jonathan Cevallos currently manages the three specialists.

His role will also be expanded to develop and streamline the business operations to increase external clients and make YSciCore more self-sustainable.

Another important recommendation is to introduce microcredentials to permit the upskilling of students and staff especially those from industry. This will also open another avenue for revenue generation.

2. User Fees, Users and Usage

The initial mandate of YSciCore was to provide NMR, mass spectrometry and microscopy services to researchers at a low cost that was affordable with FSc and the Provost providing the majority of support. All York University researchers wanting to book time and use this equipment were deemed internal users and charged the same rate no matter their Faculty. The YSciCore equipment was also made available to external non-YorkU users at higher yet still competitive rates. Experience to date has shown that the initial mandate needs to be changed given that researchers from faculties other than FSc are using the equipment more frequently than FSc researchers and are therefore not paying an equitable share. FSc cannot continue to assume this financial burden.

It is crucial that the Faculty of Health (FH) and the Lassonde School of Engineering (LSE) support their researchers use of the YSciCore equipment. The review indicated that LSE researchers use up to 80% of the time on the SEM. They are, however, not providing any support to YSciCore. LSE researchers are paying the same user fees as FSc researchers when the latter are using certain equipment at a much lower percentage of time. The review also indicated that FoH researchers use up to 30% of the time on the LSM and SDCM yet FoH is not supporting the maintenance and operation of these microscopes at all and have left it up to FSc to do this. This is simply not sustainable going forward. A different fee model needs to be put in place along with a proper business plan that should be developed.

An overview of the income generated by YSciCore is shown in Table 1. These values will be discussed briefly here but for a more comprehensive analysis, the reader is referred to the cost centre details on eReports. For the mass spectrometer, the operations person was not collecting user fees thus there wasn't any income before 2018. Since Peter Liuni was hired as a specialist and YSciCore was established, the total income generated has steadily increased since 2018. For the NMR, the internal income has also steadily increased since 2017. The three microscopes, SEM, LSCM and SDCM have seen consistent income since 2018 except for a pandemic dip in 2020.

TABLE 1: TOTAL INCOME AND EXPENDITURES (2018-2022)

	Income*	Expenditures	Balance
	\$284,347	\$304,812	
	(Revenue)	(repairs and	
		consumables)	
	\$500,000	\$1,500,000	
	(Provost)**	(Operational)	
5-Year Total	\$784,347	\$1,804,812	(-\$1,020,465)
Annual Balance	\$156,869	\$360,962	(-\$204,093)

* Values are calculated from the cost centre transaction details between January 1st 2018 and December 31st 2022. The operational cost includes the salaries of the specialists.

** This was one-time funding from Provost. From 2023-2025, CFI-IOF funding (\$240,000) was obtained to partially cover the cost of the MS Specialist as they are responsible for operating the two new mass spectrometers. Upgrading and replacing the equiopment should reduce the repairs and thus the overall cost.

The recommendation to increase user fees is warranted based on the data shown in Table 1. Some of the equipment is losing money and although the deficit cannot be made up solely through user fees, they can at least be increased. Additionally, users from outside FSc and outside York University should be paying more than FSc users. This is currently not occurring with the microscopy and NMR fees. While we want to remain competitive with fees to prevent users from going elsewhere, the convenience of having the equipment in LSB must be taken into account. The current user fees are found in Appendix D.

This evaluation of YSciCore was very revealing with regard to the composition of users of the different equipment (Appendix E). Both the MS and NMR users are predominantly from the FSc but there were some occasional users from FoH and LSE for the MS. Quite surprisingly, the majority of the users for the SEM are from LSE and represent over 70% of the users. About 70% of the CM users are from FSc with the remaining users being from FoH. There aren't any external users on the confocal microscopes.

The usage of the microscopes and NMR can be determined as the fees are based on an hourly rate. The mass spec fees are based on number of samples rather than time on the equipment. At least for the NMR and microscopes this allowed the calculation of a very rough estimate of the overall usage of the equipment. The NMR operates 24/7 as data collection can continuously occur over longer periods of time depending on the experiment. The NMR daily rate is \$120. In 2022 the income generated was \$16,425 indicating that it may have been operating for about 140 days of the year. This indicates that there is significant idle time with the NMR that can result in increased income with further usage. Really rough calculations of SEM usage in 2022 indicates that it was used for about 350 hours at \$55 per hour. This can be extrapolated to 10 weeks of usage at

35 hours per week. This suggests that the SEM is underutilized and needs further exposure to increase the number of users. The user fees for the CMs are \$18 per hour. The LSCM had about 333 hours of usage and the SDCM had about 625 hours of usage. Once trained, users are allowed to use the microscopes at any time of the day. The downwards shift in usage of the LSCM is due to it becoming obsolete as it is now more than 10 years old. The current generation of confocal microscopes have seen many improvements especially in resolution thus the microscopes are in desperate need of upgrades to remain useable by the researchers.

The rough calculation of annual usage (in days or hours) demonstrates that there is potential for growth This growth would generate more revenue and make it more sustainable. It is difficult to take into account the downtime of the equipment due to repairs and thus the number of lost hours of usage. As the equipment ages, the downtime will increase.

3. University Fund Proposal

Many users and the specialists indicated that much of the equipment was obsolete and repairs were increasing in frequency and cost. This strongly indicated that equipment upgrades or replacement were urgently needed as faculty members abilities to conduct world class research was being compromised. FSc on its own could not afford to replace or upgrade the equipment, thus a proposal, *Advancing Excellence In Research and Teaching with Critical Infrastructure Updates to YSciCore,* to the University Fund was submitted, in October 2022 requesting that the university provide the support needed to upgrade and replace the equipment. This proposal was successful and the University committed to funding up to 50% of the costs to replace or upgrade the equipment.

4. Shared Responsibilities with Faculty of Health and Lassonde School of Engineering

Discussions have begun with the ADRs in FoH and LSE and shared some of the microscopy data with them that indicate their Faculties usage. Taking this into account, I have requested them to consider providing support to YSciCore by helping to pay for the microscopy specialist salary and to upgrade the equipment. The FoH agreed to the request to provide support for upgrading the equipment and we co submitted a request for IPG grant. We were each provided \$80,000. The caveat of the IPG program is that we must upgrade rather than completely replace the LSCM.

D. IMPACT AND FINAL REMARKS

Its been over 10 years since the equipment was purchased, there have been many users including faculty members and their trainees resulting in publications, theses and grant applications. Unfortunately, however, these research outputs were not being tracked during these years. Some incomplete data was recently collected (Appendix F) but is not truly representative of the actual research impact of YSciCore. This must absolutely be captured moving forward to enable the true impact of YSiCore to be measured.

There are many recommendations that will help make YSciCore the go-to core facility of researchers in the Faculty of Science as well as Health and Lassonde. There is so much potential to do better with the facility starting with the upgrade and replacement of most of the equipment that is currently underway. Efforts need to be made by everyone to ensure that the facility becomes more sustainable so that it can be maintained well into the future for the benefit of researchers and their trainees.

APPENDICES

Appendix A: Areas and Equipment

Appendix B: Survey Results

Appendix C: Recommendations

Appendix D: Fees

Appendix E: Users

Appendix F: Impact

Appendix A Areas and Equipment

YSciCore – established in 2018



About Us

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YSciCore is the Core Analytical Facility of the Faculty of Science at York University, Toronto. Our mission is to support the scientific excellence of research programs. Each project is executed by domain experts, providing critical support from the earliest stages of grant writing and project design, through the experimental platform to data analysis. Liaise with YSciCore Facilities to access our state of the art Nuclear Magnetic Resonance platform, Mass Spectrometry and Advanced Light, and Ion and Electron Microscopy. From proteomics to Focus Ion Beam Milling, from Spinning Disk Fast Z stacking to EDX Elemental Mapping with EBDS domain orientation, from biomolecular NMR to accurate mass quantification - we ensure that findings are representative for the population.

Contact Us

Nuclear Magnetic Resonance Spectroscopy

> Howard Hunter PhD NMR Specialist (416) 736-2100 Ext. 77726 NMR@yorku.ca

Microscopy and Elemental Analysis

Magdalena Jaklewicz PhD Microscopy Specialist (647) 567-7295 Microscopy@yorku.ca

Mass Spectrometry

Maxime Rossato PhD Mass Spectrometry Specialist (416) 736-2100 Ext. 58005 Mass.Spec@yorku.ca

Or Visit YSciCore.info.yorku.ca



Nuclear Magnetic Resonance Spectroscopy



Microscopy and Elemental Analysis



Mass Spectrometry



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YSciCore



Nuclear Magnetic Resonance (NMR) Spectroscopy

Solution NMR has many applications from chemical identification to assessing chemical purity to monitoring chemical interactions. There is a wide range of techniques for observing biomolecular interactions and processes.

Capabilities

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- 1H, 2H, 13C, 15N, 19F, 29Si, 31P etc. analyses
- ¹H / ¹³C / ¹⁵N / ²H triple resonance, multinuclear acquisitions
- Variable temperature data acquisition
- HR-MAS (gel-phase) data acquisition
- Flow analysis for reaction monitoring



Advanced Light and Electron Microscopy

Capture details that cannot be seen by the unaided eye with the most advanced microscopes on the market. Science and Industry use microscopy to study materials attempting to find connections between the structure, properties and behaviour.

Capabilities

- Characterization of biomaterials and engineered structures with 3D imaging
- Live cell imaging
- High resolution optical sectioning
- Ion milling
- Failure analysis
- Nanofabrication



Elemental Analysis

Elemental analysis is an analytical technique used where elemental and structural information is required. Reverse engineer material composition or create a phase map with the help of energy dispersive spectroscopy and electron backscatter diffraction.

Capabilities

- Elemental mapping
- Particles analysis
- Phase identification and mapping
- Grain growth, boundaries and size
- Failure analysis
- Orientation mapping



High Resolution Mass Spectrometry

Mass Spectrometers measure the mass of objects, particularly atoms and molecules. They enable scientists to decipher the innermost workings of the cell, identify diagnostic blood markers in disease, and develop immunotherapies to combat pathogens.

Capabilities

 Identification and characterization of workflows in proteomics, lipidiomics and metabolomics



High Resolution Microscopy



Overview

The **YSciCore Microscopy Facility** features a highperformance field emission microscope with high, low and environmental vacuum modes. The system is equipped with electron and ion sources to accommodate the widest range of modern industrial and academic research. This most versatile of any scanning electron microscopes, the Thermo Scientific[™] Quanta[™] meets imaging requirements for life sciences, materials sciences and industrial process control.

To determine key material properties, surface images are combined with detailed elemental composition information.

The Facility's Laser Scanning and Spinning Disk Confocal microscopes provide flexibility to address challenges of cell biology.

Get all the data in one place @YorkUMicroscopy

@YorkUMicroscopy Services

Our electron and confocal microscopy capabilities cover the entire spectrum of imaging and elemental analysis:

- Surface topography at 2 nm resolution
- Dynamic characterization of phase transitions
- High resolution optical sectioning and 3D imaging
- Focus ion beam surface modification and nanofabrication
- Fast live cell imaging
- Energy dispersive spectroscopy
- Electron backscatter diffraction

Contact Us



Ғ (ठ) @YorkUMicroscopy

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or visit microscopy.info.yorku.ca



Microscopy and Elemental Analysis



High Resolution Microscopy

Our Microscopes

Thermo Scientific[™] Quanta[™]

A field emission scanning-transmission dual beam electron microscope with beam decelaration, equipped with energy dispersive spectrometer and electron backscatter diffraction. Heating and cooling stages enable capturing of dynamid processes.

Zeiss Cell Observer Spinning Disk

A confocal microscope employing spinning disk technology from Yokogawa CSU-X1 with motorized scanning stage, Z-Piezo inserts, stage-top incubation with 02 module for reducing the 02 concentration.

Zeiss Laser Scanning Microscope LSM 700

A confocal microscope for precise optical sectioning; with high contrast and high resolution for quantitative imaging, equipped with incubator and definite focus.



Our EDS/EBSD System

EDAX Octane Elect

An enhanced Energy Dispersive Spectroscopy (EDS) platform with the latest advancements in Silicon Drift Detector (SDD) technology; the System provides excellent resolution and high throughput at an optimal value with remarkable low energy sensitivity for light element detection and low voltage microanalysis.

OIM[™] Electron Backscatter Diffraction (EBSD)

An EBSD System to correlate electron backscatter diffraction patterns with crystallographic orientation and phase information.

We provide instrumental support for a wide spectrum of elemental analyses:

- Qualitative and quantitative analysis of elements present in a material
- Elemental mapping
- Orientation mapping
- Phase identification and phase mapping



Applications

NanoCharacterization

- Metals and alloys, corrosion, fractures, welds, polished sections, magnetic and superconducting materials
- Ceramics, composites, plastics
- Films and coatings
- Geological sections, minerals
- Soft materials: polymers, pharmaceuticals, filters, gels, tissues, plant material, cells
- Particles, porous materials, fibers

In situ NanoProcesses

- Hydration/dehydration
- Wetting behaviour/contact angle analysis
- Oxidation/corrosion
- Crystallization/phase transformation

NanoPrototyping

- Ion beam lithography
- Electron beam induced deposition





Mass Spectrometry



High Resolution Biological and Chemical Mass Spectrometry

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The **YSciCore Mass Spectrometry Facility** supports academic and industrial research and innovation in the Greater Toronto Area. We are located in the Life Sciences Building at York University's Keele Campus. The Facility provides chemical and biological molecular analysis services using state-of-the-art liquid chromatographymass spectrometry (LC-MS) techniques. We offer a number of workflows to support development in proteomics, metabolomics, small molecule, and high resolution accurate mass determination.



Services

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The YSciCore Mass Spectrometry Facility at York University offers a wide range of MS and LC-MS services:

- High Resolution Accurate Mass (HRAM)
- Fragmentation and Structural Analysis (MSn)
- Protein Intact Mass Determination
- Proteome Profiling (nanoLC-MS)
- Peptide Mapping (nanoLC-MS)
- Metabolome Profiling (LC-MS)
- Small Molecule Quantitation (LC-MS)
- Untargeted and Targeted Quantitative
 Proteomics (nanoLC-MS)

We understand certain workflows come with their unique requirements. The Facility offers flexibility in its service offerings and is happy to accommodate your specific needs.

Contact Us

Maxime Rossato PhD Mass Spectrometry Specialist (416) 736-2100 Ext. 58005 Mass.Spec@yorku.ca

> or visit <u>YSciCore.info.yorku.ca</u>



Mass Spectrometry



MASS_SPEC2019.indd 1

Mass Spectrometry

Proteomics

Proteomics is the qualitative and quantitative study of the proteome under physiological and pathological conditions. With our high-resolution Orbitrap Elite and Easy nanoLC1000 UPLC system, the facility can support numerous proteomic workflows such as:

- Stable Isotope Labelling with Amino Acids in Cell
 Culture (SILAC)
- iTRAQ and Tandem Mass Tag (TMT) Labelling
- Label Free Quantitation
- Shotgun Profiling

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Bioinformatic tools and computers are able to sequence the enormous amount of data into protein quantities, interaction partners, and networks; which ultimately assist in understanding and developing better treatments for a variety of diseases. The Facility has licensed installations with recurring updates for the following software:

- Proteome Discoverer 1.4
- Proteome Discoverer 2.2
- MaxQuant 1.6.2.3



Biological Molecules

Proteins adopt a number of different conformations and modified states that occur both in the cell and during biopharmaceutical manufacturing. Identifying and quantifying these proteoforms is critical for developing a fundamental understanding of their function in health and disease, as well as providing information on their safety, efficacy, and stability as protein-based biotherapeutics.

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The Orbitrap Elite is uniquely suited for proteoform discovery-based investigations and can provide multiattribute methods (MAM) to monitor critical quality attributes including:

- Post-Translational Modifications (Deamidation, Oxidation, Glycosylation, etc.)
- Changes in Protein Mass (Clips, Truncations,
- Mutations)
- Higher Order Structural Changes





Small-molecule

Small molecule quantitative LC-MS/MS methods are a cornerstone in pharmaceutical ADME/DMPK studies, biomarker validation, clinical research, food safety, forensics, toxicology, and environmental analyses.

The YSciCore Facility houses an Agilent 1260 Infinity II Quaternary HPLC system that is capable of supporting a wide-range of small-molecule workflows in:

- Metabolomics
- Lipidomics
- Small and large biological molecule
- characterization and quantitation







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Nuclear Magnetic Resonance



NMR for Chemical Analysis, Mixture Analysis and Biomolecular Interactions

Nuclear Magnetic Resonance (NMR) spectroscopy provides a fundamental source of insight into chemical structure and molecular interactions. The four solution NMR spectrometers operating at 300, 400, 600 and 700 MHz are capable of observing a wide variety of nuclei, including proton, carbon, phosphorous, fluorine and boron, to name a few. In addition to chemical identification, the enhanced sensitivity of the 700 MHz spectrometer equipped with cryo-probe technology enables the analysis of biological molecules, including nucleic acids, proteins and cellular metabolites. A combination of experiments can be used to determine molecular structure along with the nature of interactions with other molecules. Rapid data collection is facilitated using NonUniform Sampling (NUS).

Services

The YSciCore NMR Facility at York University offers a wide range of NMR services:

- Routine acquisition of 1D spectra
- Complete spectral analysis
- Quantitative analysis
- Impurity analysis
- NMR operator training
- Consultation
- Fast sample turn-around
- Reaction kinetics analysis

Contact Us

Howard Hunter PhD NMR Specialist (416) 736-2100 Ext. 77726 NMR@yorku.ca

> or visit <u>YSciCore.info.yorku.ca</u>



Nuclear Magnetic Resonance Spectroscopy



Nuclear Magnetic Resonance

Biological NMR Interactions

- Protein Structure The 700 MHz NMR spectrometer is capable of collecting multi-dimensional spectra leading to protein structure determination. Deuterium decoupling is available for labelled samples.
- Protein-Substrate Binding Using labelled samples and substrate titrations, binding interactions can be studied using ¹H-¹⁵N HSQC spectra. The nature of ligand binding to macromolecular receptors can also be evaluated using Saturation Transfer Difference (STD) spectroscopy.
- Enzyme Kinetics Enzyme catalysis can be followed by monitoring the resonance intensity change over a period of time.
- Metabolomics The enhanced resolution and sensitivity of the 700 MHz NMR spectrometer is optimal for identification and quantification of metabolites from cellular studies.

Chemical NMR Interactions

- Routine Spectra ¹H and ¹³C spectra can be provided for sample characterization.
- Structure Determination Using a suite of 1D and 2D programs, spectra can be acquired to assist with chemical identification. Detailed analysis reports can be provided upon request.
- Quantitative NMR Quantative NMR assays can provide purity analysis of compounds using various nuclei including proton, fluorine, phosphorous, carbon and other nuclei.
- Mixture Analysis Component analysis of complex solutions can be identified and quantified.
- Trace Analysis At 700 MHz impurities can be detected and quantified.

Capabilities

700MHz

- Three-channel ¹H, ¹³C, ¹⁵N, ²H cryogenic probe for biological samples
- 1D, 2D, 3D ... nD acquisitions
- NonUniform Sampling

600MHz

- Three-channel ¹H, ¹³C, ³¹P, ²H probe
- Broad banded probe for multinuclear studies of low quantity samples
- HRMAS probe for gel-phase samples
- Flow probe for on-the-fly reaction monitoring

400MHz

- Two-channel broad banded automatic tune and match probe (including fluorine)
- Variable temperature
- Sample changer with full automation

300MHz

- Teaching and training instrument
- Two-channel broad banded automatic tune and match probe (including fluorine)
- Variable temperature
- Sample changer with full automation





NMR Applications Currently Assisting:

Biological Research

- Protein Ligand Interactions
- Protein Structure
- Nucleic Acid Folding
- Metabolomics

Chemical Research

- Organic Synthesis Structure Verification
- Organo-metallic Synthesis
- Reaction Kinetics
- Catalysis Studies
- Gasification Effluent Analysis

Industrial Applications

- Pharmaceuticals
- Contract Manufacturing
- Industrial Chemical Quality Monitoring
- Lubricant Manufacturing
- Agricultural Products
- Environmental Studies

New Equipment - 2023

- Octet BLI
- Aurora Flow Cytometer
- timsTOF MS
- ZenoTOF MS

Appendix B Survey Results

Survey Results



Are you aware of YSciCore?


Survey Results



Are you satisfied with turnaround time?







Survey Results



How many HQP users?



Survey Results



What is your department?





Appendix C Recommendations

Recommendations - Governance

- Establish an Advisory Board/Governance Committee made up of researchers, Brad/Jonathan, Specialists, DRP, ADRP with at least an annual meeting to oversee governance.
- Three subcommittees to oversee the 3 areas that meet more often than once a year.
- The annual meeting will include updates from each of the specialists.
- Specialists must provide annual reports to their manager who will share with DRP and ADRP.

Recommendations - Oversight & Management

- There should be an Academic Director of YSciCore who will provide high level management and ensure that the overall mission is being fulfilled.
- The Academic Director that will oversee the quarterly and annual operations and management
- Evaluations must occur every 3-5 years.
- Specialist Manager currently Jonathan Cevallos
- The role of the Manager will be to develop and streamline the business operations

Recommendations - Operations

- Increase user fees.
- Establish tiered fees for users (1) in FSc, (2) outside FSc and (3) external to YU.
- Establish a business plan to increase external users.
- Establish guidelines for repair/service of equipment.
- Develop user agreement
- Establish a policy or procedure to add new equipment to the facility.
- Ensure acknowledgement of YSciCore in publications

Recommendations - Sustainability

- LSE should pay for their share of the SEM costs as they are the major users.
- FH should pay for their share of confocal microscopy as they are major users
- Charge annual maintenance costs for all researchers that use the facility
- Ensure that fees are charged according to actual usage and that everyone is charged.

Recommendations - Facility

- Add more equipment such as is found in LSB or FARQ or CHEM to make it more sustainable.
- Ensure that user fees are charged for this equipment.
- Ensure that the specialists are running the samples especially for untrained users.

Recommendations - Future

- Consider other equipment in Health and LSE that could be incorporated into YSciCore Facility
- Relaunch of YSciCore once new equipment has been added (Science Unplugged event in 2018).
- Evaluate potential for VPRI to take over management of Tri-Faculty Core Facility (TFCF)
- Introduce microcredentials to boost revenue and train students and industrial partners

Operations to Date

- Three specialists are responsible for managing, operating and training of the equipment.
- The specialists were managed by Margaret Hough until July 2022.
- The specialists are currently managed by Jonathan Cevallos.

Appendix D Fees

Microscopy

Microscopy	Rate[\$]	Unit
Field-Emission Scanning Electron	55	hr
	55	111
Variable Pressure Electron Microscopy (ESEM)	55	hr
Low Vacuum Electron Microscopy (LV-		
SEM)	55	hr
Focus Ion Beam (FIB)	120	hr
Energy Dispersive Spectroscopy (EDS)	55	hr
Cooling Stage	70	hr
Heating Stage	100	hr
Spinning Disk Confocal Microscopy	18	hr
Laser Scanning Confocal Microscopy	18	hr

Nuclear Magnetic Resonance

- According to the 700 MHz NMR guidelines there are 2 categories for rates:
- A- any section of continuous time of more than 8 consecutive hours at \$5.00 per hour;
- B- any time less than 8 consecutive hours at \$15.00 per hour.

Mass Spectrometry

Pricing *

LC-MS/MS - Proteome profiling, complex sample - Internal - 60 LC-MS/MS - Proteome profiling, complex sample - External academic - 95 LC-MS/MS - Proteome profiling, complex sample - Commercial - 125 LC-MS/MS - Small molecules - Internal - 45 LC-MS/MS - Small molecules - External academic - 70 LC-MS/MS - Small molecules - Commercial - 95 Data processing, training on software - Internal - 30 / 30 minutes period. Data processing, training on software - External academic - 45 / 30 minutes period. Data processing, training on software - Commercial - 60 / 30 minutes period. HRAM - MS (direct injection) - Internal - 20 HRAM - MS (direct injection) - External academic - 30 HRAM - MS (direct injection) - Commercial - 40 HRAM - MS/MS (direct injection) - Internal - 20 HRAM - MS/MS (direct injection) - External academic - 30 HRAM - MS/MS (direct injection) - Commercial - 40 LC-MS/MS - Peptide mapping, purified sample - Internal - 45 LC-MS/MS - Peptide mapping, purified sample - External academic - 70 LC-MS/MS - Peptide mapping, purified sample - Commercial - 95

Metabolomics, contact closure mode, high flow - Internal – 30

Analysis package - Custom pricing - Please refer to pricing agreed by e-mail.

Prices are indicated without applicable taxes in canadian dollars (C\$). Prices may be subject to change.

Appendix E Users

Nuclear Magnetic Resonance

Faculty of Science

Logan Donaldson Philip Johnson Vivian Saridakis Gerald Audette Yi Sheng Thomas Baumgartner (CRC) Dasantila Golemi-Kotra Chris Caputo (CRC) Chun Peng (YRC) Derek Wilson (YRC) Gary Sweeney (YRC) **Christine** Le Mark Bayfield Arturo Orellana Georg Zoidl (CRC) Gino Lavoie Ryan Hili

Mass Spectrometry

Faculty of Science

Arturo Orellana Chris Caputo (CRC) **Christine** Le Chun Peng (YRC) Dasantila Golemi-Kotra Peter Cheung Derek Wilson (YRC) Georg Zoidl (CRC) Howard Hunter Logan Donaldson **Ozzy Mermut** Gino Lavoie Ryan Hili Rui Wang Thomas Baumgartner (CRC) **Yi Sheng**

Faculty of Health

Emilie Roudier David Hood Christopher Perry Anthony Scimè

Lassonde School of Engineering

Satinder Brar

Scanning Electron Microscope

Lassonde School of Engineering

Alidad Amirfazli Solomon Boakye-Yiadom Satinder Brar Thomas Cooper Alex Czekanski Ebrahim Ghafar-Zadeh Gerd Grau Roger Kempers Magdalena Krol Siu Ning Leung Pouya Rezai Reza Rizvi Terry Sachlos

Faculty of Science

Rui Wang Jennifer Chen Art Forer Raymond Kwong Ozzy Mermut (YRC) Sylvie Morin Laurence Packer

Faculty of Health

Marco Colavecchi

Laser Scanning Confocal Microscope

Faculty of Science

Mark Bayfield Art Forer Nik Kovinich Terry Kubiseski Pat Lakin-Thomas John McDermott Jean-Paul Paluzzi Chun Peng (YRC) Yi Sheng Gary Sweeney (YRC) Robert Tsushima Georg Zoidl (CRC)

Faculty of Health

Arthur Cheng Dorota Crawford Tara Haas Chris Perry Anthony Scime

Spinning Disk Confocal Microscope

Faculty of Science

Terry Kubiseski John McDermott Jean-Paul Paluzzi Chun Peng (YRC) Yi Sheng Rui Wang Georg Zoidl (CRC)

Faculty of Health

Dorota Crawford Tara Haas Anthony Scime

Appendix F Impact

Impact

	MS	NMR	MICROSCOPY	TOTAL
PUBLICATIONS	5	37	56	98
STUDENTS	25	21	197	243
RESEARCHERS	9	8	50	67
THESES	25	12	23	60

There is overlap in some of the numbers as some students used more than one facility.