**University of Waterloo**  
**SENATE**  
**Notice of Meeting**  

**Date:** Monday 25 March 2019  
**Time:** 3:30 p.m.  
**Place:** Needles Hall, room 3407

<table>
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<tr>
<th>Time</th>
<th>OPEN SESSION</th>
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| 3:30 | **Consent Agenda**  
**Motion:** To approve or receive for information by consent items 1-4 below.  
1. Minutes of the 25 February 2019 Meeting | Decision |
|      | 2. Reports from Committees and Councils  
a. Graduate & Research Council | Information |
|      | 3. Report of the President  
a. Recognition and Commendation | Information |
|      | 4. Reports from the Faculties | Information |
| 3:35 | **Regular Agenda**  
5. Business Arising from the Minutes |  
6. Reports from Teaching Awards Committees  
a. Amit & Meena Chakma Awards for Exceptional Teaching by a Student Committee* | Information |
|      | b. Distinguished Teacher Awards Committee* | Information |
|      | 7. Presentations  
a. Richard Wu, President, Federation of Students  
b. Naima Samuel, President, Graduate Students Association | Information |
|      | 8. Reports from Committees and Councils  
a. Finance Committee* | Decision |
|      | b. Graduate & Research Council | Decision |
| 4:00 | 9. Report of the President | Information |
| 4:05 | 10. Q&A Period with the President | Information |
| 4:25 | 12. Report of the Vice-President, University Research & International | Information |
| 4:35 | 13. Other Business |  
**CONFIDENTIAL SESSION**  
4:45 | 14. Minutes of the 25 February 2019 Meeting | Decision |
| 4:50 | 15. Business Arising from the Minutes |  
4:55 | 16. Report of the President | Information |
| 5:00 | 17. Report of the Vice-President, Advancement  
a. Donor List – 2017/18 Gifts and Pledges $250,000+ | Information |
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<tr>
<td>5:05</td>
<td>18. Reports from Committees and Councils</td>
<td>Nominating Committee for Dean of Arts*</td>
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<td>19. Other Business</td>
<td>Decision</td>
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*to be distributed
18 March 2019

Karen Jack
University Secretary
Secretary to Senate
University of Waterloo
SENATE
Minutes of the 25 February 2019 Meeting


Guests: Clare Bermingham, Donna Ellis, Erin Gillespie, Ross Johnston, David Kibble, Jennifer Kieffer, Derek Madge, Nick Manning, Norah McRae, Flora Ng, Diana Parry, Alice Raynard, Chris Read, Ian Rowlands, Daniella Seskar Hencic, Emily Schroeder, Brandon Sweet, Allan Starr


*regrets
**joined by telephone

OPEN SESSION

The chair welcomed members to the meeting.

Consent Agenda
Senate heard a motion to approve or receive for information the items on the consent agenda.

Skidmore and Randall.

1. MINUTES OF THE 21 JANUARY 2019 MEETING
Senate approved the minutes of the meeting.

2. REPORTS FROM COMMITTEES AND COUNCILS
Graduate & Research Council. Senate received the report for information.

Undergraduate Council. Senate heard the following motion:

Faculty of Science
Motion: That Senate approve the inactivation of the Honours Co-operative Chemistry, Biobased Specialization.

Senate received the remainder of the report for information.

3. REPORT OF THE PRESIDENT
a. Tenure & Promotion. Senate received the report for information.
b. Honorary Degrees & Convocation Speakers. Senate received the report for information.
c. Recognition and Commendation. Senate received the report for information.

4. REPORTS FROM THE FACULTIES
Senate received the reports for information.

5. COMMITTEE APPOINTMENTS
Senate approved the following appointments:

Distinguished Teacher Awards Committee: Shannon Dea (philosophy) as faculty representative, term ending 31 December 2021 and Naima Samuel as graduate student representative, term ending 31 December 2021.

Amit & Meena Chakma Awards for Exceptional Teaching by a Student Selection Committee: Naima Samuel as graduate student representative, term ending 31 December 2021 and Stella Arthur as graduate student representative, term ending 31 December 2021.

The question was called, and the motion carried unanimously.

Regular Agenda

6. BUSINESS ARISING FROM THE MINUTES
There was no business arising.

7. TEACHING PRESENTATION – DONNA ELLIS, DIRECTOR, CENTRE FOR TEACHING EXCELLENCE, THE FUTURE CLASSROOM
Mario Coniglio introduced Donna Ellis who spoke about “The Future Classroom”. Members heard about: the shift to a learning paradigm; creating experiential opportunities; underpinning research and theories; new and flexible classroom spaces and options; the integration of technology. In discussion: concerns about acoustics in some spaces are part of the conversation; costs, and the value in the investment of different spaces; lessons learned from other post-secondary leaders on this front.

8. REPORTS FROM COMMITTEES AND COUNCILS
University Appointments Review Committee. Senate received the report for information. Flora Ng, chair of the committee, spoke to her presentation, highlighting data about the proposals reviewed by the committee in 2017-18. In discussion: Ng indicated that decreases in female appointments may be an anomaly, but should be watched; and, numbers of definite term hires are not high.

9. REPORT OF THE PRESIDENT
The president provided Senators with an update on recent activities and matters. Members heard about: themes and key subjects under discussion at the World Economic Forum at Davos (in particular: climate change, the future of work, AI/data science, cybersecurity, the need for talent and skills in the workplace and ways educators can engage and be key players on this front); an update on the student mental health initiative (including that 50% of recommendations are underway or completed, upcoming work); further discussion of the impact of the tuition rollback and some detail re: student fees, including the impact to student government; next steps with respect to the Strategic Plan development.

10. Q&A PERIOD WITH THE PRESIDENT
In discussion: work being done through COU re: the impact of the tuition announcement on student government; the University’s obligations re: thresholds for domestic students; agreement for Casello to present information re: graduate recruitment at a future meeting; with respect to recruitment of female faculty, the observation that the University’s numbers are not inconsistent with others across
Canada, but agreement that efforts on this front ought to be bolstered; concern over the impact of the province’s changes to OSAP.

11. REPORT OF THE VICE-PRESIDENT, ACADEMIC & PROVOST

2018-19 Operating Budget Update. Rush provided an update on the 2018/19 operating budget and planning for 2019/20. Members heard: the budget for 2018/19 was balanced with a small surplus; details re: enrolment numbers, and income and expenses. With respect to 2019/20 planning, Rush spoke to: the government’s policy announcement and its impact; some environmental parameters; the University’s considerations and responses; plans with respect to enrolment and ways to increase revenues and decrease expenses. In discussion: the enrolment planning process; the challenges of increasing domestic Master’s students, but advice that improvement on this front is occurring; discussions are taking place re: ways to reduce expenses; plans to make up for the shortfall include maximizing both traditional and non-traditional sources of funding and one-time contributions from unallocated resources; consultation with and communication to the community will continue. Rush also advised Senate on continuing activities on the student experience review.

12. REPORT OF THE VICE PRESIDENT, UNIVERSITY RESEARCH & INTERNATIONAL

Senate received the report for information.

13. OTHER BUSINESS

There was no other business.

Senate convened in confidential session.

10 March 2019
Karen Jack
University Secretary
CONFIDENTIAL SESSION

The confidential minutes have been removed.
The confidential minutes have been removed.
Senate Graduate & Research Council met on 11 February 2019 and agreed to forward the following items to Senate for information as part of the consent agenda.

Further details are available at: [https://uwaterloo.ca/secretariat/committees-and-councils/senate-graduate-research-council](https://uwaterloo.ca/secretariat/committees-and-councils/senate-graduate-research-council)

**FOR INFORMATION**

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**CURRICULAR SUBMISSIONS**

On behalf of Senate, council approved new courses, course revisions, course inactivation, new milestones, and minor program revisions for the Faculties of Engineering (electrical and computer engineering; civil and environmental engineering; chemical engineering; mechanical and mechatronics engineering) and Environment (environment, enterprise and development; geography and environmental management).

**RENEWAL OF CENTRES AND INSTITUTES**

On behalf of Senate, council approved the renewal, for a 5-year term, of the Centre for Ocular Research & Education (CORE), as presented.

**GRADUATE AWARDS**

On behalf of Senate, council approved the Tim Collings Graduate Research Scholarship (endowment).

/\kw
Jeff Casello  Charmaine Dean
Associate Vice-President, Graduate Studies and Vice President, Research & International
Postdoctoral Affairs
University of Waterloo
SENATE
Report of the President
25 March 2019

FOR INFORMATION

Recognition and Commendation

Recognized as a pioneer in quantum information research and technology, Professor Raymond Laflamme was invested into the Order of Canada for his significant scientific and leadership contributions to the country. (adapted from Faculty of Science News 4 February 2019)

Professor Paul Parker from the School of Environment, Enterprise and Development (SEED) and the Department of Geography and Environmental Management (GEM), received the Economic Developers Council of Ontario (EDCO) President’s Award in recognition of his contribution to graduate studies and professional training for his contributions as the Director of the University of Waterloo's Economic Development Program over the past decade, and as a professor in the Master of Economic Development and Innovation program for more than 20 years. (adapted from the Faculty of Environment News 7 February 2019)

University Professor Linda Nazar, from the Department of Chemistry, has been awarded the Chemical Institute of Canada's (CIC) highest honour - the 2019 CIC Medal - for her outstanding contribution to the science of chemistry in Canada. She is best known for her advancements in battery systems and clean energy storage. (adapted from Faculty of Science News 8 February 2019)

Each month, the Office of the President recognizes students, faculty, staff and alumni who go above and beyond. The President’s Accolades celebrate stories of dedication, passion and contribution from our University community.

Congratulations to the University of Waterloo community members currently being recognized from January:

- University of Waterloo Athletics and other campus groups and community partners collected 381 toys for under privileged children during the Stuff the Warriors Van Toy Drive.
- Hilary Bergsieker was recently named as a Rising Star in her field by the Association for Psychological Sciences.
- The Department of Athletics and Recreation’s Think Pink campaign raised an impressive $15,782 for the Breast Cancer Cause at the Canadian Cancer Society.
- IST staff member Linda Zhang, once an international student herself, has been volunteering her time to organize Saturday Breakfast Seminars for international students to discuss their struggles and explore coping strategies and how to build resilience.
- The Women’s Volleyball team continue their historic season and remaining undefeated with a perfect 13-0 record through to the end of January, leading all OUA teams.
- The 89 volunteer trainers facilitating the LGBTQ+ Making Spaces Program have helped close to 300 students, faculty and staff across campus learn more about gender identity/expression, sexual identity, homophobia and how these intersect with other identities.
- Day in and day out, Kathy Schiekoff goes above and beyond to make the Tim Horton’s
location at Modern Languages an exceptional place to visit.

(adapted from the Daily Bulletin 13 February 2019)

University Professor M. Tamer Özsu has received the 2018 Lifetime Achievement Award in Computer Science from CS-Can/Info-Can. Conferred annually since 2014, these prestigious national awards recognize faculty members in departments, schools and faculties of computer science who have made outstanding and sustained achievement in research, teaching and service. (adapted from Faculty of Math News 15 February 2019)

The University has received recognition for initiatives undertaken to support the physical and psychological health of our employees. Presented to the Healthy Workplace Committee, the certificate of merit recognizes the value of our commitment and delivery of ‘Keeping Well at Work Day 2018’ event. The event is considered an outstanding initiative focused on creating a safe and healthy workplace as showcased in Canada’s Healthy Workplace Month® 2018. Receipt of this award further supports the University’s commitment to the integration of Excellence Canada’s Excellence, Innovation, and Wellness (EIW) Standard across the university as a national quality model against which to measure and enable organizational excellence, innovation and wellness. (adapted from the Daily Bulletin 19 February 2019)

Carl Haas, chair of Waterloo’s civil and environmental engineering department, is the recipient of the American Society of Civil Engineers' 2019 Computing in Civil Engineering Award. (adapted from Faculty of Engineering News 21 February 2019)

The University of Waterloo’s efforts to adopt the Excellence, Innovation and Wellness (EIW) Standard have been profiled on Excellence Canada’s website. Among those units celebrated for receiving the Canada Awards for Excellence are:

- The Library;
- Human Resources;
- The Office of the Vice-President, Academic & Provost; and
- Organizational and Human Development (OHD).

(adapted from the Daily Bulletin 27 February 2019)

Quacquarelli Symonds (QS) released their 2019 World University Rankings and once again Waterloo finds itself standing amongst the best universities at home and around the world. Building momentum in several subjects and subject areas Waterloo has five subjects ranking among the top 50 universities in the world. Waterloo ranked at the top globally in Computer Science, 22nd in the world, Hospitality and Leisure Management, 32nd, Mathematics, 43rd, and Engineering and Technology — a broad subject area including chemical, civil, electrical engineering and more — ranked 46th. Once again clinching first place in all of Canada — a place it’s held three years running — is the Recreation and Leisure Studies program, categorized by QS as, Hospitality and Leisure Management. Globally, it came 32nd among more than 1,100 universities ranked by QS. Computer science at Waterloo made a significant jump from 31st to 22nd place in a highly competitive category. Domestically, computer science also did exceptionally well, placing 2nd in Canada. (adapted from the Daily Bulletin 28 February 2019)

On Friday, February 8, the Faculty of Science celebrated the successes and accomplishments of four outstanding alumni. Over 100 family, friends, colleagues, and members of the university community attended the event. Two Young Alumni Award recipients, Martha Breithaupt Oner and April Pawluk,
were honoured for their extraordinary professional accomplishments and contributions to society. Robert Myers and George Pinho, notable for their high-impact and far-reaching achievements, received Distinguished Alumni Awards. (adapted from the Daily Bulletin 28 February 2019)

John Yeow, a systems design engineering professor, was recently named a fellow of Engineers Canada. The prestigious fellowship honours individuals who have given noteworthy service to the engineering profession through their work with either Engineers Canada or its provincial and territorial engineering regulators. (adapted from Faculty of Engineering News 28 February 2019)

As part of the commitment to the UN Women’s HeForShe IMPACT 10x10x10 initiative, the University of Waterloo hosted the third annual HeForShe Writing Contest. Waterloo students, staff, faculty and alumni were invited to share their stories about building a better and more equitable world. And for the second year, high school students from across the Waterloo Regional District School Board (WRDSB) were also invited to share their stories in the youth category. Judges from the University and the WRDSB selected six talented winners:

- Emily Shilton, Faculty of Engineering student
- Adriana Ceric, Grade 10 student
- Anonymous contribution, Faculty member
- Danielle Liu, Grade 9 student
- Samantha Mirandola, Faculty of Arts student
- Destiny Hopkins, Grade 12 student

For the second year in a row, the University of Waterloo has received a Canada’s Best Diversity Employer award. In early March, representatives from Human Resources, Organizational & Human Development and the Equity Office accepted the award at a ceremony in Toronto. The Canada’s Best Diversity Employers Award recognizes organizations from the Canada’s Top 100 employer group that have exceptional workplace diversity and inclusiveness programs. Employers are awarded for noteworthy and unique diversity initiatives for one or more of the following groups a) Women; b) Members of visible minorities; c) Persons with disabilities; d) Aboriginal peoples; and e) Lesbian, Gay, Bisexual and Transgendered/Transsexual (LGBT) peoples. (adapted from the Daily Bulletin 7 March 2019)

The Centre for Extended Learning (CEL) has announced the 2017 and 2018 winners of the University of Waterloo’s Online Teaching Awards, which recognize teaching and course design excellence in fully online undergraduate- or graduate-level courses and programs.

**Award for Excellence in Online Course Design**
- 2018 - GEOG 181: Designing Effective Maps. Course authors Peter Deadman, Peter Johnson and Scott MacFarlane.

**Award for Excellence in Online Teaching**
- 2018 - Natalie Hunter
- 2017 - Ian VanderBurgh

(adapted from the Daily Bulletin 13 March 2019)

Congratulations to Brenda Lee (physics & astronomy) and Steve Balaban (accounting & finance) for receiving the 2018-2019 Feds Excellence in Undergraduate Teaching Award. (Federation of Students)
FOR INFORMATION

A. APPOINTMENTS

Adjunct Appointments
Graduate Supervision
LAU, Lincoln, Assistant Professor, School of Public Health and Health Systems, February 1, 2019 – December 31, 2020.

SIMMONS, Debra, Assistant Professor, School of Public Health and Health Systems, January 1, 2019 – December 31, 2024.

Special Appointments
Undergraduate Instruction
McNAUGHTON, Julian. Lecturer, Department of Recreation and Leisure Studies, May 1, 2019 – August 31, 2019.

PARKINSON, Robert, Lecturer, Department of Kinesiology, January 7, 2019 – April 30, 2019.

STEVENS, Zachary, Lecturer, Department of Recreation and Leisure Studies, May 1, 2019 – August 31, 2019.

Postdoctoral Fellow to Research Appointments


B. SABBATICAL

Already approved by the Board of Governors
TUPLING, Russell, Professor, Department of Kinesiology, May 1, 2019 – April 30, 2020, 100% salary.

Paul Stolee, Interim Dean
Faculty of Applied Health Sciences
UNIVERSITY OF WATERLOO
REPORT OF THE DEAN OF THE FACULTY OF ARTS TO SENATE
March 25, 2019

FOR INFORMATION

A. APPOINTMENTS

Post-Doctoral Appointment
SINGH, Nachatter, Department of Religious Studies, October 1, 2019 to December 30, 2019.

Adjunct Reappointments – Instruction
TURNER, Graeme, Lecturer, School of Accounting and Finance, January 1, 2019 to April 30, 2019.

B. ADMINISTRATIVE APPOINTMENTS

CARVALHO, Emanuel, Interim Director, Stratford School of Interaction Design and Business, January 1 to June 30, 2019

COWAN, Doug, Associate Chair, Graduate Studies, Department of Religious Studies, January 1, 2019 to June 30, 2019.

MALONE, Paul, Associate Chair, Undergraduate Studies, Department of Germanic and Slavic Studies, January 1, 2019 to June 30, 2019.

SUDERMAN, Derek, Acting Chair, Department of Religious Studies, February 10 to October 15, 2019.

Reappointments
ACHESON, Katherine, Associate Dean, Undergraduate Programs, July 1, 2019 to June 30, 2022.

Change in Dates
AGER, Sheila, Interim Chair, Department of Fine Arts, from November 22, 2017 to December 31, 2018 to November 22, 2017 to June 30, 2019.

BETZ, Emma, Associate Chair, Undergraduate Studies, Department of Germanic and Slavic Studies from July 1, 2017 to June 30, 2019 to July 1, 2017 to December 31, 2018.

JAKOBSH, Doris, Associate Chair, Graduate Studies, Department of Religious Studies from July 1, 2018 to June 30, 2019 to July 1, 2018 to December 31, 2018.

SELJAK, David, Chair, Department of Religious Studies, from July 1, 2018 to June 30, 2022 to July 1 2018 to February 9, 2019 and October 16, 2019 to June 30, 2022.

C. SABBATICAL LEAVES

Approved by the Board of Governors
SINGH, Rashmee, Associate Professor, Department of Sociology and Legal Studies, March 1, 2019 to August 31, 2019, six months at 85% salary.

For approval by the Board of Governors
BERGSIEKER, Hilary, Assistant Professor, July 1, 2019 to December 31, 2019, six months at 85% salary.
GORMAN, Dan, Professor, Department of History, July 1, 2019 to December 31, 2019, six months at 85% salary.

MOSCOVITCH, David, Professor, Department of Psychology, July 1, 2019 to December 31, 2019, six months at full salary.

PACKALEN, Mikko, Associate Professor, Department of Economics, July 1, 2019 to June 30, 2020, twelve months at 90.6% salary.

RASMUSSEN, Ann Marie, Professor, Department of Germanic and Slavic Studies, July 1, 2019 to December 31, 2019, six months at 85% salary.

SEN, Anindya, Professor, Department of Economics, July 1, 2019 to June 30, 2020, twelve months at full salary.

Change in Dates
CARVALHO, Emanuel, Associate Professor, Department of Economics, from January 1 to December 31, 2019 to July 1, 2019 to June 30, 2021.

Douglas M. Peers
Dean, Faculty of Arts
FOR INFORMATION

A. APPOINTMENTS

Probationary Term Reappointment
KIM, Na Young, Associate Professor, Department of Electrical & Computer Engineering; Postdoctoral Scholar, Department of Applied Physics, Stanford University, California, USA, 2010; PhD Applied Physics, Stanford University, Stanford California, USA, 2006; BaSc Physics, Seoul National University, Seoul, Korea, 1998.

New Definite Term-full time
HUANG, Ziqiang (Patrick), Research Assistant Professor, Department of Electrical & Computer Engineering, July 1, 2019 – June 30, 2022. PhD Candidate, Duke University, Durham, NC, January 2014 – present; MSc, Duke University, 2014; BASc, East China University of Science and Technology, (ECUST), 2012. Patrick is a spousal hire and his expertise is in computer architecture. He will be collaborating with several faculty members in the computer hardware and embedded systems area.

Definite Term Reappointment-full time
BORJI, Amir, Research Assistant Professor, Department of Electrical & Computer Engineering, February 1, 2019 – March 31, 2019.

Visiting Appointments

CHEN, Guang, Scholar, Department of Chemical Engineering, July 1, 2019 – June 30, 2020.


LIU, Yuxia, Scholar, Department of Chemical Engineering, July 1, 2019 – June 30, 2020.

Qi, Ronghui, Scholar, Department of Mechanical & Mechatronics Engineering, March 25, 2019 – September 24, 2019.


XIAO, Tonghu, Associate Professor, Department of Chemical Engineering, December 27, 2018 – August 26, 2019.

XIAOMIN, Li, Researcher, Department of Civil & Environmental Engineering, April 30, 2019 – April 29, 2020.

Visiting Reappointments
ABEDI, Daryoush, Scholar, Department of Chemical Engineering, March 20, 2019 – June 30, 2019.

Special Appointments
Undergraduate Instruction
HUANG, Ned, Lecturer, Department of Mechanical & Mechatronics Engineering, November 1, 2018 – December 31, 2018.

Special Reappointments
Undergraduate Instruction
WASEF, Albert, Lecturer, Department of Electrical & Computer Engineering, May 1, 2019 – April 30, 2020.

Adjunct Appointments
Graduate Supervision
SHABAN, Khaled, Associate Professor, Department of Electrical & Computer Engineering, June 1, 2018 – May 31, 2021.

Adjunct Reappointments
Research
CONLE, Albrecht, Professor, Department of Civil & Environmental Engineering, March 1, 2019 – February 28, 2021.

Cross Appointments
THOMSON, Neil R., Professor, Department of Civil Engineering to Department of Chemical Engineering, January 1, 2019 – December 31, 2023.

Changes in Appointments
HRYNK, Trevor, Assistant Professor, Department of Civil & Environmental Engineering, May 1, 2019 – June 2022, change in start date of probationary term from March 1, 2019 to May 1, 2019.

B. ADMINISTRATIVE APPOINTMENTS
ABUKHDEIR, Nasser, Associate Chair, Graduate Studies, Department of Chemical Engineering, September 1, 2019 – December 31, 2019.
GOSTICK, Jeff, Associate Chair, Graduate Studies, Department of Chemical Engineering, March 1, 2019 – August 31, 2019.

FOR APPROVAL BY THE BOARD OF GOVERNORS

C. SABBATICALS
WILLET, Thomas, L., Assistant Professor, Department of Systems Design Engineering, July 1, 2019 – December 31, 2019, six months at 100% salary.

ALREADY APPROVED BY THE BOARD OF GOVERNORS

D. SPECIAL LEAVE
KULIC, Dana, Associate Professor, Department of Electrical & Computer Engineering, January 1, 2019 – December 31, 2019, twelve month unpaid leave.

Bruce Hellinga, Acting Dean

(On behalf of Pearl Sullivan
Dean, Faculty of Engineering)
FOR INFORMATION

A. **APPOINTMENTS** (for approval by the Board of Governors)

**Probationary-Term Reappointments**

YARD, Jon, Associate Professor, Dept. of Combinatorics and Optimization, July 1, 2019 – June 30, 2022.

**Definite Term – Reappointments**


**Continuing Lecturer – Appointments**

NELSON, Jen, Lecturer, Office of the Dean, effective July 1, 2019.

TOMPKINS, Dave, Lecturer, David R. Cheriton School of Computer Science, effective July 1, 2019.

**Visiting Appointments**


ELKHADRAWY, Reda Ragab (Tanta University), Scholar, Dept. of Applied Mathematics, April 1, 2019 – September 30, 2019.

KIM, Daewoo (Handong Global University), David R. Cheriton School of Computer Science, February 10, 2019 – August 9, 2019.


UR REHMAN, Khalil (Quaid-i-Azam University), Researcher, Dept. of Applied Mathematics, March 1, 2019 – August 31, 2019.

**Adjunct Appointments**

**Research**

HE, Meng, (Dalhousie University), Assistant Professor, David R. Cheriton School of Computer Science, July 1, 2019 – June 30, 2020.

**Adjunct Reappointments**

**Research**

ALENCAR, Paulo, Professor, David R. Cheriton School of Computer Science, January 18, 2019 – June 30, 2022.

GEL, Yulia (University of Texas at Dallas), Associate Professor, January 1, 2019 – December 31, 2021.
Cross Reappointments
GHODSI, Ali (Professor, Dept. of Statistics and Actuarial Science), in the David R. Cheriton School of Computer Science, February 1, 2019 – June 30, 2024.

GOLAB, Wojciech (Associate Professor, Dept. of Electrical & Computer Engineering), in the David R. Cheriton School of Computer Science, February 1, 2019 – June 30, 2022.

POUPART, Pascal (Professor, David R. Cheriton School of Computer Science), in the Dept. of Statistics and Actuarial Science, November 1, 2018 – October 31, 2020.

VECHTOMOVA, Olga (Associate Professor, Management Sciences), in the David R. Cheriton School of Computer Science, February 1, 2019 – June 30, 2022.


Graduate Students reappointed as Part-time Lecturers
CAMPBELL, Rutger, Dept. of Combinatorics and Optimization, January 1, 2019 – April 30, 2019.

Postdoctoral Fellows appointed as Part-time Lecturers

FLEISCHER, Lukas, David R. Cheriton School of Computer Science, May 1, 2019 – October 31, 2019.

B. ADMINISTRATIVE APPOINTMENTS
NELSON, Peter, Associate Chair for Undergraduate Studies, Dept. of Combinatorics and Optimization, July 1, 2019 – June 30, 2020.

WOLKOWICZ, Henry, Associate Director, Graduate Studies, Computational Mathematics, July 1, 2019 – June 30, 2020.

ADMINISTRATIVE REAPPOINTMENTS

FORREST, Brian, Faculty Teaching Fellow, Office of the Dean, July 1, 2019 – June 30, 2021.

C. SABBATIONALS (already approval by the Board of Governors)
GUENIN, Bertrand, Professor, Dept. of Combinatorics and Optimization, May 1, 2019 – April 30, 2020, with 100% salary.

LANK, Edward, Professor, David R. Cheriton School of Computer Science, January 1, 2020 – June 30, 2020 at 85% salary. This is an early sabbatical.

Stephen M. Watt
Dean
For information:

A. APPOINTMENTS

Visiting Appointments


GAO, HeBei, Visiting Scholar, Department of Physics and Astronomy, February 1, 2019 to August 31, 2019.


SUI, Lili, Visiting Researcher, Department of Earth and Environmental Sciences, February 1, 2019 to February 1, 2020.

Adjunct Appointments

Graduate Supervision

AL-ABADLEH, Hind, Professor, Department of Earth and Environmental Sciences, December 1, 2018 to November 30, 2021.

DAVIS, Donald, Professor, Department of Earth and Environmental Sciences, October 1, 2018 to September 30, 2021.

Special Reappointments

Undergraduate Instruction

ROSAMOND, Madeline, Lecturer, Department of Earth and Environmental Sciences, April 1, 2019 to April 30, 2019.

Research Associate Reappointed as Part-time Lecturer

LEE, Brenda, Lecturer, Department of Physics and Astronomy, January 1, 2019 to April 30, 2019.

B. ADMINISTRATIVE REAPPOINTMENTS

ROSS, Martin, Associate Chair, Graduate Studies, Department of Earth and Environmental Sciences, January 1, 2019 to December 30, 2020.

R.P. Lemieux
Dean
Senate Graduate & Research Council met on 11 February 2019 and agreed to forward the following items to Senate for approval as part of the regular agenda.

Further details are available at: https://uwaterloo.ca/secretariat/committees-and-councils/senate-graduate-research-council

FOR APPROVAL

DISSOLUTION OF RESEARCH CENTRE

Centre for Ecosystem Resilience & Adaptation

1. **Motion:** To approve the dissolution of the Centre for Ecosystem Resilience & Adaptation in 2019—with the Centre account remaining open until the end of fiscal year 2019, as presented in Attachment 1.

**Rationale:** Centre Director and professor, Stephen D. Murphy, states that the Centre for Ecosystem Resilience & Adaptation (ERA) has fulfilled its mandate; the recommendation is that the Centre be dissolved for the following reasons:

- When the Centre was conceived and created, it was unique in its mandate; 10+ years later, there are now several more Centres or other entities focused on narrower issues within the broad scope of ‘resilience and adaptation’ and the broader mandate of ERA is no longer unique.
- ERA was tied into the former Research/Teaching Centre at Huntsville. The University ended its lease agreement a couple of years ago. The demise of the agreement with the Huntsville facility meant the demise of the majority of ERA's external funding opportunities that were being negotiated at the time of the end of the agreement.
- As ERA attracted external international members and the University of Waterloo members were diffused amongst other Centres or entities, ERA now is more of a think tank and is a source of soft power and influence rather than the more common model for Centres (e.g. focused on University of Waterloo group publications). With the relationships with external members firmly established, the international roles of the ERA members will continue without the need for a formal ERA structure.

PROGRAM CHANGE

Faculty of Engineering

2. **Motion:** To approve the revision to 4 Master’s and 3 PhD programs within the department of Chemical Engineering by replacing the core course list with prescribed courses foundational to the discipline and introducing a mandatory seminar-based (half) course focused on research methods and ethics training, effective Fall 2019, as presented in Attachment 2.

**Rationale:**

a) Changes to meet the objectives of the CHE graduate program:

- To teach advance fundamental concepts in Chemical Engineering beyond that of an undergraduate curriculum.
- To teach scientific and engineering research methods including research ethics and scholarly communication.
- To teach graduate-level introductory concepts in specific research areas strategic to the department faculty.
b) Changes to meet the objectives of the CHE graduate program (practice-focused):
   • To teach advance fundamental concepts in Chemical Engineering beyond that of undergraduate program.
   • Introduce to professional practice issues (e.g., Engineering ethics, tort & contract law, engineering practice in Ontario).
   • To teach graduate-level introductory concepts in specific research areas strategic to the department faculty.

c) Both research and practice-focused graduate students will likely benefit from professional practice information. Consequently, providing training in engineering ethics, practice and law will make the graduate program more desirable and relevant. Additionally, formalizing initial training in research methods and ethics would both benefit research quality and reduce research ethics issues.

/ku
Jeff Casello
Associate Vice-President, Graduate Studies and Postdoctoral Affairs

Charmaine Dean
Vice President, Research & International
MEMORANDUM

TO: Senate Graduate and Research Council
CC: Kathy Winter
    Secretariat
    Stephen Murphy
    Director, Centre for Ecosystem Resilience and Adaptation
    Bernard Duncker
    Associate Vice-President, Interdisciplinary Research

FROM: Charmaine B. Dean
      Vice-President, Research and International

DATE: Friday, January 25, 2019

RE: Support for the Dissolution of the Centre for Ecosystem Resilience and Adaptation

The enclosed letter was received on 10 December 2018 by Stephen Murphy, Director of the Centre for Ecosystem Resilience and Adaptation recommending that the Centre be dissolved in 2019. This memo is to advise that the Office of Research supports the recommendation that the Centre be dissolved.
10 December 2018

To: Dr. Charmaine Dean, VP of Research, University of Waterloo
From: Stephen Murphy, Director of the Centre for Ecosystem Resilience and Adaptation
Re: Review of Centre for Ecosystem Resilience and Adaptation

Dear Dr. Dean

In consultation with Office of Research staff regarding the appropriate format, and ahead of the 2 January 2019 deadline, I write this memo to you to recommend the Centre for Ecosystem Resilience and Adaptation be dissolved in 2019 (date to be specified by your office).

I have discussed this issue with my Dean, Jean Andrey of the Faculty of Environment, and she indicated she would support my recommendation whatever it may be.

I recognize that the final decision is not mine to make but I will be stepping aside regardless; my reasons for recommending the Centre be dissolved relate to three main domains.

1. When the Centre was conceived and created, it was unique in its mandate; 10+ years later, there are now several more Centres or other entities focused on narrower issues within the broad scope of ‘resilience and adaptation’ and the broader mandate of ERA is no longer unique.
2. ERA was tied into the former Research/Teaching Centre at Huntsville. The University ended its lease agreement a couple of years ago. The demise of the agreement with the Huntsville facility meant the demise of the majority of ERA’s external funding opportunities that were being negotiated at the time of the end of the agreement.
3. As ERA attracted external international members and the University of Waterloo members were diffused amongst other Centres or entities, ERA now is more of a think tank and is a source of soft power and influence rather than the more common model for Centres (e.g. focused on University of Waterloo group publications)¹. With the relationships with external members firmly established, the international roles of the ERA members will continue without the need for a formal ERA structure.

All Centres have a shelf life and then should hand off roles to successors. I think this is where ERA is now; it has fulfilled its mandate. It is time to sunset the Centre as the new University Strategic Plan draws near.

Yours,

Stephen D. Murphy, B.Sc. (Hons.), PhD.
Professor and Director of SERS; Director of the Centre for Ecosystem Resilience and Adaptation

¹ Please see Addenda 1 and 2.
Addendum 1.

ERA has been active on two fronts: high level advisory roles and publications. The former fits the notion of ERA as a ‘think tank’ and the latter also involves not just University of Waterloo members but also external (international) members. In brief, here is a list of highlights:

- A peer reviewed book – Routledge Handbook of Ecological and Environmental Restoration (2017; 600+ pages) - co-edited by ERA member Stephen Murphy and with chapters written mainly by international members of ERA.
- Ongoing co-sponsorship of translational ecology workshops for Ontario civil staff (mainly Ontario Ministry of Natural Resources and Forestry); such events have been held each of the last 10 years, attracting 100 attendees.
- An international leaders symposium on ecosystem resilience at the 2016 Ecological Society of America conference (Fort Lauderdale Florida, August)
- Three symposia and workshops involving international leaders on Translational Ecology at the Ecological Society of America 2017 conference in Portland OR.
- An international leaders’ conference on social and ecological resilience held on Galiano Island, BC in May 2017; this was co-sponsored by the John Templeton Foundation.
- A series of papers exploring the notion of how standards and practices relate to ecological restoration and resilience (Nature Ecology & Evolution https://doi.org/10.1038/s41559-018-0483-9; Restoration Ecology 26:399-403 & 431-433).

As noted in the main text, sunsetting ERA should not have an impact on the ERA members’ ability to continue these roles, given the diffusion of external and internal members amongst other Centres or research entities.
Addendum 2.

If the University decides to sunset ERA, I note there are three major events where ERA already has agreed to co-lead.

1. An April 2019 leaders’ symposium on resilience in the face of ‘designer ecosystems’. This involves 30 invited international leaders meeting in Vancouver and producing a white paper on the topic at hand. The University of Victoria and Genome Canada are also sponsors.

2. An August 2019 symposium at the Ecological Society of America conference (Louisville KY) on translational ecology; this follows from the 2017 event at ESA Portland Oregon and the special issue of Frontiers in Ecology and Evolution. There will 15 international leaders meeting and speaking at this conference, with an invited paper to appear (most likely in Frontiers again).

3. A September 2019 Royal Society (London) symposium on ecosystem resilience. 35 international leaders (including senior members of the United Nations) will attend and produce a peer reviewed paper (Phil Trans Roy Soc Lond) and (likely) a high level United Nations report that follows from the 2018 IPCC events.

With your permission, I would like to keep the ERA account open through at least the end of FY 2019 (ending April 30 2020) so the remaining funds therein can be used to help support these major events that will still carry the ERA branding and legacy. Those funds are ones that I raised (via contracts with federal and international agencies) to support ERA. No further contracts or grants would be undertaken (using the ERA brand) past the sunset date.
February 20, 2019

Kathy Winter
Assistant University Secretary
and Privacy Officer
Secretariat, Needles Hall
University of Waterloo

Re: Dissolution of the Centre for Ecological Resilience and Adapation

I am writing to support the recommendation of Dr. Stephen Murphy that the Senate-approved Centre for Ecological Resilience and Adaptation be dissolved. The Faculty’s rationale for supporting Dr. Murphy’s recommendation is congruent with the points that he made in his letter of recommendation.

1. The Centre was established 10 years ago, in part, to create a focus for the research activities taking place at the Huntsville Summit Centre for the Environment, which was opened in 2011 with full-time staff, as well as hosting summer field courses. University of Waterloo terminated its lease with the Town of Huntsville in 2017, replacing residential field courses with campus-focused experiential education.

2. The Centre played a catalytic role in forging linkages between University of Waterloo researchers and external experts and organizations, e.g., Society of Ecological Restoration, Society for Conservation Biology, UNESCO, Centre for Applied Science in Ontario Protected Areas, Ontario Weed Science Society, Canadian Weed Science Society. All of these relationships are now mature and stable.

3. Related research at the University of Waterloo is brought together in two ways. Within the Faculty of Environment: 17 research clusters have been formed to create communities of learning, where graduate students working with different advisors but similar topics are co-located. The two clusters of particular relevance to the Centre are the Ecology cluster, https://uwaterloo.ca/environment/graduate/clusters/ecology, and the Hydrology and Geochemistry cluster, https://uwaterloo.ca/scholar/rpetrone/home. At the University level, researchers are brought together by the Water Institute, the Waterloo Centre for Microbial Research and the Interdisciplinary Centre on Climate Change.

Sincerely,

Jean Andrey
Dean, Faculty of Environment
Prior to form submission, review the content revision instructions and information regarding major/minor modifications. For questions about the form submission, contact Trevor Clews, Graduate Studies Office.

Faculty: Engineering

Program: Master of Applied Science (MASc) in Chemical Engineering

Program contact name(s): Nasser M. Abukhdeir

Form completed by: Bettina Wahl/Judy Caron

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the SGRC Course/Milestone-New/Revision/Inactivation form (PC docx version or MAC docx version).

1. Replacement of core course list with prescribed courses foundational to the discipline.
2. Introduction of mandatory seminar-based (half) course focused on research methods and ethics training.

Is this a major modification to the program? Yes

Rationale for change(s):

Changes to meet the objectives of the CHE graduate program:

1. To teach advance fundamental concepts in Chemical Engineering beyond that of undergraduate curriculum.
2. To teach scientific and engineering research methods including research ethics and scholarly communication.
3. To teach graduate-level introductory concepts in specific research areas strategic to the department faculty.

Proposed effective date: Term: Fall Year: 2019

Current Graduate Studies Academic Calendar (GSAC) page (include the link to the web page where the changes are to be made):

https://uwaterloo.ca/graduate-studies-academic-calendar/engineering/department-chemical-engineering/master-applied-science-masc-chemical-engineering

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<tr>
<th>Current Graduate Studies Academic Calendar content:</th>
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### Current Graduate Studies Academic Calendar

**content:**

- **Graduate Academic Integrity Module (Graduate AIM)**

**Courses**

- Students with a Chemical Engineering background must complete 4 graduate courses (0.50 unit weight per course). Within these courses:
  - At least 2 must be core CHE courses, as listed below.
  - No more than 1 may be a 500 level course or held with course.
  - No more than 2 may be taught by supervisor(s).
  - No more than 1 may be a reading course.

- Students with a Non-Chemical Engineering background must complete 4 graduate courses (0.50 unit weight per course). Within these courses:
  - At least 3 must be core CHE courses, as listed below.
  - No more than 1 may be a 500 level course or held with course.
  - No more than 2 may be taught by supervisor(s).
  - No more than 1 may be a reading course.

- At least half of the courses for degree requirements must be Chemical Engineering graduate courses.

- Core CHE courses:
  - CHE 610 Transport Phenomena
  - CHE 612 Interfacial Phenomena
  - CHE 620 Applied Engineering Mathematics
  - CHE 622 Statistics in Engineering
  - CHE 630 Chemical Reactor Analysis
  - CHE 640 Principles of Polymer Science
  - CHE 660 Principles of Biochemical Engineering
  - NANO 701 Fundamentals of Nanotechnology (two 0.25 credit NANO 701 modules)
  - NANO 702 Nanotechnology Tools (two 0.25 credit NANO 702 modules)

### Proposed Graduate Studies Academic Calendar

**content:**

- **Graduate Academic Integrity Module (Graduate AIM)**

**Courses**

- Students must complete CHE 600 (.25 credit weight) and 4 graduate courses (0.50 unit weight per course) as follows:
  - CHE 601 or CHE 602
  - 3 graduate level elective courses (1 elective must be a CHE course)

- For students with a non-Chemical Engineering background, 2 electives must be CHE courses.
- No more than 1 may be a 500 level course.
- No more than 2 may be taught by supervisor(s).
- No more than 1 may be a reading course.

- The courses to be taken will be selected in consultation with the student's research supervisor. The normal full load is at least two 0.50 unit weight courses per term while concurrently maintaining acceptable progress in the research project.

- Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar.

- The Faculty of Engineering requires that no more than one half of the courses used for credit towards a graduate degree may be taught by a student’s supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule: in such cases, the student’s file must contain a statement of formal approval from the Chemical Engineering Department and endorsement from the Associate Dean for Graduate Studies and Research of Engineering.

- Only courses taken within five years prior to the completion of the MASc degree may be counted for credit towards a degree, unless a request for revalidation is granted.

- Students must achieve a:
  - Minimum cumulative average of 70%.
  - Minimum grade of 65% in each course.
Current Graduate Studies Academic Calendar content:

- The courses to be taken will be selected in consultation with the student's research supervisor. The normal full load is at least two 0.50 unit weight courses per term while concurrently maintaining acceptable progress in the research project.

- Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar.

- The Faculty of Engineering requires that no more than one half of the courses used for credit towards a graduate degree may be taught by a student’s supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule: in such cases, the student's file must contain a statement of formal approval from the Chemical Engineering Department and endorsement from the Associate Dean for Graduate Studies and Research of Engineering.

- Only courses taken within five years prior to the completion of the MASc degree may be counted for credit towards a degree, unless a request for revalidation is granted.

- Students must achieve a:
  - Minimum cumulative average of 70%.
  - Minimum grade of 65% in each non-core course.
  - Minimum grade of 70% in each core course.
  - Note: Probationary students may have specific grade requirements, which will be specified in their admission letters.

- Each student is responsible for monitoring their own academic records and must immediately notify the Graduate Coordinator of any inadequate grade or average.

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How will students currently registered in the program be impacted by these changes?

*Current students would be grandfathered under the current requirements.*
Departmental approval date (mm/dd/yy): 05/14/2018

Reviewed by GSO (for GSO use only) ☐ date (mm/dd/yy): 10/03/2018

Faculty approval date (mm/dd/yy): 11/20/2018

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):

31
Prior to form submission, review the content revision instructions and information regarding major/minor modifications. For questions about the form submission, contact Trevor Clews, Graduate Studies Office.

Faculty: Engineering

Program: Master of Applied Science (MASc) in Chemical Engineering - Nanotechnology

Program contact name(s): Nasser M. Abukhdeir

Form completed by: Bettina Wahl/Judy Caron

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Course/Milestone-New/Revision/Inactivation form (PC docx version or MAC docx version).

1. Replacement of core course list with prescribed courses foundational to the discipline.
2. Introduction of mandatory seminar-based (half) course focused on research methods and ethics training.

Is this a major modification to the program? Yes

Rationale for change(s):
Changes to meet the objectives of the CHE graduate program:
1. To teach advance fundamental concepts in Chemical Engineering beyond that of undergraduate curriculum.
2. To teach scientific and engineering research methods including research ethics and scholarly communication.
3. To teach graduate-level introductory concepts in specific research areas strategic to the department faculty.

Proposed effective date: Term: Fall Year: 2019

Current Graduate Studies Academic Calendar (GSAC) page (include the link to the web page where the changes are to be made):

https://uwaterloo.ca/graduate-studies-academic-calendar/engineering/department-chemical-engineering/master-applied-science-masc-chemical-engineering-nanotechnology

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<td>▪ Students must complete 4 courses, including 2 core CHE courses and 2 Nanotechnology elective courses.</td>
<td>▪ Students must complete CHE 600 (0.25 credit weight) and 4 graduate courses (0.50 unit weight per course) as follows:</td>
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<td>▪ The core courses provide the base knowledge and skill set required to prepare students for more specialized courses and to conduct interdisciplinary nanoscale research. The following core CHE courses are required for students with no prior nanotechnology degree from the University of Waterloo:</td>
<td>▪ No more than 2 may be taught by supervisor(s).</td>
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<td>▪ Note: Students who have a Bachelor of Applied Science (BASc) in Nanotechnology Engineering from the University of Waterloo are not allowed to take NANO 701 or NANO 702. Instead, they may choose any 2 courses from the list of Nanotechnology Electives.</td>
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<td>▪ Nanotechnology elective courses:</td>
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<td>▪ (a) Micro/nano Instruments and Devices</td>
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<td>▪ BIOL 642 Current topics in Biotechnology</td>
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<td></td>
<td>▪ CHEM 720 Topic 13 Selected Topics in Analytical Chemistry: Biosensors and Nanotechnology</td>
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<td>▪ CHEM 750 Topic 17 Selected Topics in Physical Chemistry: Surface Science and Nanotechnology</td>
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<td>▪ CHEM 750 Topic 23 Selected Topics in Physical Chemistry: Processes at Micro-Nano Scales</td>
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<td>▪ ME 738 Special Topics in Materials: Materials for NEMS and MEMS</td>
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<td>▪ ME 760 Special Topics in Thermal Engineering</td>
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<td>▪ ME 780 Special Topics in Mechatronics</td>
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<td>▪ SYDE 682 Advanced MicroElectroMechanical Systems: Principles, Design &amp; Fabrication</td>
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<td>o No more than 1 reading course.</td>
<td>▪ SYDE 750 Topic 24 Topics in Systems Modelling: Modelling, Simulation and Design of MEMS</td>
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<td>▪ Nanotechnology elective courses:</td>
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<td>▪ CHEM 750 Topic 17 Selected Topics in Physical Chemistry: Surface Science and Nanotechnology</td>
<td>▪ ECE 630 Physics and Models of Semiconductor Devices</td>
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<td>▪ CHE 620 Applied Engineering Mathematics</td>
<td>▪ ECE 639 Characteristics &amp; Applications of Amorphous Silicon</td>
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<td>▪ CHEM 750 Topic 19 Selected Topics in Physical Chemistry: Carbon Nanotube Electronics</td>
<td>▪ ECE 676 Quantum Information Processing Devices</td>
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<td>▪ ECE 630 Physics and Models of Semiconductor Devices</td>
<td>▪ ECE 677 Quantum Electronics and Photonics</td>
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<td>▪ ECE 631 Microelectronic Processing Technology</td>
<td>▪ ECE 730 Topic 10 Special Topics in Solid State Devices: Advanced Technology for Semiconductor Processing</td>
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<td>▪ ECE 633 Nanoelectronics</td>
<td>▪ ECE 730 Topic 19 Special Topics in Solid State Devices: Magnetism and Spintronics</td>
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<td>▪ ECE 730 Topic 26 Special Topics in Solid State Devices: MBE and Quantum Nano Devices</td>
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<td>▪ ECE 637 Digital Integrated Circuits</td>
<td>▪ ECE 770 Topic 18 Special Topics in Antenna and Microwave Theory: Nanoelectronics for QIP</td>
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<td>▪ ECE 639 Characteristics &amp; Applications of Amorphous Silicon</td>
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<td>▪ ECE 672 Optoelectronic Devices</td>
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<td>▪ BIOL 608 Advanced Molecular Genetics</td>
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<td>▪ BIOL 614 Bioinformatics Tools and Techniques</td>
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<td>▪ BIOL 629 Cell Growth and Differentiation</td>
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<td>▪ BIOL 678 Current topics in Neurophysiology</td>
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<td>▪ CHE 622 Statistics in Engineering</td>
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<td>▪ CHE 660 Principles of Biochemical Engineering</td>
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<td>▪ CHE 765 Research Topics in Biochemical Engineering</td>
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<td>▪ ECE 730 Topic 25 Special Topics in Solid State Devices: Microfluidic &amp; Nanobiotech Systems</td>
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<td>▪ PHYS 751 Clinical Applications of Physics in Medicine</td>
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<td>▪ PHYS 752 Molecular Biophysics</td>
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<td>▪ CHE 745 Research Topics in Polymer Science and Engineering</td>
</tr>
<tr>
<td>▪ CHE 660 Principles of Biochemical Engineering</td>
<td>▪ CHE 750 Special Topics in Materials Science: Thin Film Fabrications &amp; Mechanical Properties</td>
</tr>
<tr>
<td>▪ CHE 760 Special Topics in Biochemical Engineering</td>
<td>▪ CHE 755 Research Topics in Electrochemical Engineering, Interfacial Engineering &amp; Material Science</td>
</tr>
<tr>
<td>▪ CHE 765 Research Topics in Biochemical Engineering</td>
<td>▪ CHEM 710 Topic 17 Selected Topics in Inorganic Chemistry: Nanostructured Materials and Integrative Chemistry</td>
</tr>
<tr>
<td>▪ CHEM 737 Enzymes</td>
<td>▪ CHEM 713 Chemistry of Inorganic Solid State Materials</td>
</tr>
<tr>
<td>▪ PHYS 751 Clinical Applications of Physics in Medicine</td>
<td>▪ CHEM 750 Topic 17 Selected Topics in Physical Chemistry: Surface Science and Nanotechnology</td>
</tr>
<tr>
<td>▪ PHYS 752 Molecular Biophysics</td>
<td>▪ CHEM 770 Principles of Nanotechnology</td>
</tr>
<tr>
<td>▪ (d) Nanomaterials</td>
<td>▪ CHEM 773 Topic 11 Selected Topics in Polymer Chemistry: Synthesis, Self-assembly and Materials Application of Inorganic Polymers</td>
</tr>
<tr>
<td>▪ CHE 610 Theory and Application of Transport Phenomena</td>
<td>▪ CHEM 773 Topic 14 Selected Topics in Polymer Chemistry: Living Polymerization Techniques</td>
</tr>
<tr>
<td>▪ CHE 612 Interfacial Phenomena</td>
<td>▪ CHEM 773 Topic XX Selected Topics in Polymer Chemistry: Noncovalent Interactions &amp; Supramolecular Chemistry</td>
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<td>▪ CHE 622 Statistics in Engineering</td>
<td>▪ ME 632 Experimental Methods in Materials Engineering</td>
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<td>▪ CHE 630 Chemical Reactor Analysis</td>
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<td>▪ CHE 640 Principles of Polymer Science</td>
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<tr>
<td>▪ CHE 641 Physical Properties of Polymers (cross-listed with CHEM 771)</td>
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<tr>
<td>▪ CHE 740 Special Topics in Polymer Science and Engineering</td>
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<td>▪ CHEM 720 Topic 14 Selected Topics in Analytical Chemistry: Nanomaterials for Energy Conversion and Clean Environment</td>
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<td>▪ ME 738 Special Topics in Materials: Materials for NEMS and MEMS</td>
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<tr>
<td>▪ CHEM 713 Chemistry of Inorganic Solid State Materials</td>
<td>▪ ME 738 Topic 8 Special Topics in Materials: Introductory and Advanced Nanomechanics</td>
</tr>
<tr>
<td>▪ CHEM 720 Topic 14 Selected Topics in Analytical Chemistry: Nanomaterials for Energy Conversion and Clean Environment</td>
<td>▪ PHYS 701 Quantum Mechanics 1</td>
</tr>
<tr>
<td>▪ CHEM 750 Topic 17 Selected Topics in Physical Chemistry: Surface Science and Nanotechnology</td>
<td>▪ PHYS 704 Statistical Physics 1</td>
</tr>
<tr>
<td>▪ CHEM 770 Principles of Polymer Science</td>
<td>▪ PHYS 706 Electromagnetic Theory</td>
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<tr>
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<td>• The courses to be taken will be selected in consultation with the student's research supervisor. The normal full load is at least two 0.50 unit weight courses per term while concurrently maintaining acceptable progress in the research project.</td>
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<tr>
<td>▪ CHEM 773 Topic XX Selected Topics in Polymer Chemistry: Noncovalent Interactions &amp; Supramolecular Chemistry</td>
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<td>▪ ME 632 Experimental Methods in Materials Engineering</td>
<td>• The Faculty of Engineering requires that no more than one half of the courses used for credit towards a graduate degree may be taught by a student's supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule; in such cases, the student's file must contain a statement of formal approval from the Chemical Engineering Department and endorsement from the Associate Dean for Graduate Studies and Research of Engineering.</td>
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<td>▪ ME 738 Special Topics in Materials: Materials for NEMS and MEMS</td>
<td>• Only courses taken within five years prior to the completion of the MASc degree may be counted for credit towards a degree, unless a request for revalidation is granted.</td>
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<td>▪ ME 738 Topic 8 Special Topics in Materials: Introductory and Advanced Nanomechanics</td>
<td>• Students must achieve a:</td>
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<tr>
<td>▪ PHYS 701 Quantum Mechanics 1</td>
<td>- Minimum cumulative average of 70%.</td>
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<tr>
<td>▪ PHYS 704 Statistical Physics 1</td>
<td>- Minimum grade of 65% in each course.</td>
</tr>
<tr>
<td>▪ PHYS 706 Electromagnetic Theory</td>
<td>- Note: Probationary students may have specific grade requirements, which will be specified in their admission letter.</td>
</tr>
<tr>
<td>▪ PHYS 773 Special Topics</td>
<td>- Students must achieve a:</td>
</tr>
</tbody>
</table>

- Minimum cumulative average of 70%.
- Minimum grade of 65% in each individual non-core course.
- Minimum grade of 70% in each core course.
- Note: Probationary students may have specific grade requirements, which will be specified in their admission letter.
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<tr>
<td>• At least 50% of the final grade in core courses will be determined by a final exam.</td>
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How will students currently registered in the program be impacted by these changes?

_Current students would be grandfathered under the current requirements._

**Departmental approval date** (mm/dd/yy): 05/14/2018

**Reviewed by GSO** (for GSO use only) □ date (mm/dd/yy): 10/03/2018

**Faculty approval date** (mm/dd/yy): 11/20/2018

**Senate Graduate & Research Council (SGRC) approval date** (mm/dd/yy):

**Senate approval date** (mm/dd/yy) (if applicable):
Prior to form submission, review the content revision instructions and information regarding major/minor modifications. For questions about the form submission, contact Trevor Clews, Graduate Studies Office.

Faculty: Engineering

Program: Master of Applied Science (MASc) in Chemical Engineering - Water

Program contact name(s): Nasser M. Abukhdeir

Form completed by: Bettina Wahl/Judy Caron

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Course/Milestone-New/Revision/Inactivation form (PC docx version or MAC docx version).

1. Replacement of core course list with prescribed courses foundational to the discipline.
2. Introduction of mandatory seminar-based (half) course focused on research methods and ethics training.

Is this a major modification to the program? Yes

Rationale for change(s):

Changes to meet the objectives of the CHE graduate program:

1. To teach advance fundamental concepts in Chemical Engineering beyond that of undergraduate curriculum.
2. To teach scientific and engineering research methods including research ethics and scholarly communication.
3. To teach graduate-level introductory concepts in specific research areas strategic to the department faculty.

Proposed effective date: Term: Fall Year: 2019

Current Graduate Studies Academic Calendar (GSAC) page (include the link to the web page where the changes are to be made):

https://uwaterloo.ca/graduate-studies-academic-calendar/engineering/department-chemical-engineering/master-applied-science-masc-chemical-engineering-water

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</table>
### Current Graduate Studies Academic Calendar

#### Content:
- **Graduate Academic Integrity Module (Graduate AIM)**

#### Courses

- Students with a Chemical Engineering background must complete 5 graduate courses (0.50 unit weight per course). Within these courses:
  - At least 2 must be core CHE courses, as listed below.
  - 2 must be core WATER courses, WATER 601 and WATER 602.
  - No more than 1 may be a 500 level or held with course.
  - No more than 2 may be taught by supervisor(s).
  - No more than 1 may be a reading or seminar course.

- Students with a Non-Chemical Engineering background must complete 5 graduate courses (0.50 unit weight per course). Within these courses:
  - At least 3 must be core CHE courses, as listed below.
  - 2 must be core WATER courses, WATER 601 and WATER 602.
  - No more than 1 may be a 500 level or held with course.
  - No more than 2 may be taught by supervisor(s).
  - No more than 1 may be a reading or seminar course.
  - At least half of the courses for degree requirements must be Chemical Engineering graduate courses.

- This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602).

- Core Water courses:
  - WATER 601 Integrated Water Management

### Proposed Graduate Studies Academic Calendar

#### Content:
- **Graduate Academic Integrity Module (Graduate AIM)**

#### Courses

- Students must complete CHE 600 (0.25 credit weight) and 4 graduate courses (0.50 unit weight per course) as follows:
  - CHE 601 or CHE 602
  - WATER 601
  - WATER 602
  - 1 graduate level CHE elective course
- No more than 1 may be a 500 level course.
- No more than 2 may be taught by supervisor(s).
- No more than 1 may be a reading course.
- This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602).
- The courses to be taken will be selected in consultation with the student's research supervisor. The normal full load is at least two 0.50 unit weight courses per term while concurrently maintaining acceptable progress in the research project.
- Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar.
- The Faculty of Engineering requires that no more than one half of the courses used for credit towards a graduate degree may be taught by a student’s supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule: in such cases, the student's file must contain a statement of formal approval from the Chemical Engineering Department and endorsement from the Associate Dean for Graduate Studies and Research of
### Current Graduate Studies Academic Calendar content:

- WATER 602 Integrated Water Management Project

- **Core CHE courses:**
  - CHE 610 Transport Phenomena
  - CHE 612 Interfacial Phenomena
  - CHE 620 Applied Engineering Mathematics
  - CHE 622 Statistics in Engineering
  - CHE 630 Chemical Reactor Analysis
  - CHE 640 Principles of Polymer Science
  - CHE 660 Principles of Biochemical engineering
  - NANO 701 Fundamentals of Nanotechnology (two 0.25 credit NANO 701 modules)
  - NANO 702 Nanotechnology Tools (two 0.25 credit NANO 702 modules)

- Students must achieve a:
  - Minimum cumulative average of 70%.
  - Minimum grade of 65% in each individual course.
  - Minimum grade of 70% in each core course.
  - Note: Probationary students may have specific grade requirements, which will be specified in their admission letters.

- Each student is responsible for monitoring their own academic records and must immediately notify the Graduate Coordinator of any inadequate grade or average.

- At least 50% of the final grade in core courses will be determined by a final written exam.

### Proposed Graduate Studies Academic Calendar content:

- Engineering.

- Only courses taken within five years prior to the completion of the MASc degree may be counted for credit towards a degree, unless a request for revalidation is granted.

- Students must achieve a:
  - Minimum cumulative average of 70%.
  - Minimum grade of 65% in each course.
  - Note: Probationary students may have specific grade requirements, which will be specified in their admission letters.

- Each student is responsible for monitoring their own academic records and must immediately notify the Graduate Coordinator of any inadequate grade or average.

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**How will students currently registered in the program be impacted by these changes?**

*Current students would be grandfathered under the current requirements.*

Departmental approval date (mm/dd/yy): 05/14/2018

Reviewed by GSO (for GSO use only) ☐ date (mm/dd/yy): 10/03/2018

Faculty approval date (mm/dd/yy): 11/20/2018

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):
Prior to form submission, review the content revision instructions and information regarding major/minor modifications. For questions about the form submission, contact Trevor Clews, Graduate Studies Office.

Faculty: Engineering

Program: Doctor of Philosophy (PhD) in Chemical Engineering

Program contact name(s): Nasser M. Abukhdeir

Form completed by: Bettina Wahl/Judy Caron

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submitnion of the SGRC Course/Milestone-New/Revision/Inactivation form (PC docx version or MAC docx version).

1. Replacement of core course list with prescribed courses foundational to the discipline.
2. Introduction of mandatory seminar-based (half) course focused on research methods and ethics training

Is this a major modification to the program?

Rationale for change(s):

Changes to meet the objectives of the CHE graduate program:

1. To teach advance fundamental concepts in Chemical Engineering beyond that of undergraduate curriculum.
2. To teach scientific and engineering research methods including research ethics and scholarly communication.
3. To teach graduate-level introductory concepts in specific research areas strategic to the department faculty.

Proposed effective date: Term: Fall Year: 2019

Current Graduate Studies Academic Calendar (GSAC) page (include the link to the web page where the changes are to be made):

https://uwaterloo.ca/graduate-studies-academic-calendar/engineering/department-chemical-engineering/doctor-philosophy-phd-chemical-engineering

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Current Graduate Studies Academic Calendar content:

- **Courses**
  - Students with a Chemical Engineering background with a MASc degree must complete 3 graduate courses (0.50 unit weight per course). Within these courses:
    - At least 2 must be core CHE courses, as listed below.
    - 3 must be 600 or 700 level graduate courses.
    - No more than 1 may be a held with course.
    - No more than 1 may be taught by supervisor(s).
    - No more than 1 may be a reading course.

- Students with a Chemical Engineering background without a MASc degree must complete 7 graduate courses (0.50 unit weight per course). Within these courses:
  - At least 4 must be core CHE courses, as listed below.
  - 5 must be 600 or 700 level graduate courses.
  - No more than 2 may be 500 level or held with courses.
  - No more than 2 may be taught by supervisor(s).
  - No more than 1 may be a reading course.

- Students with a Non-Chemical Engineering background with a MASc degree must complete 3 core graduate courses (0.50 unit weight per course). Within these courses:
  - At least 3 must be core CHE courses, as listed below.
  - 3 must be 600 or 700 level graduate courses.
  - No more than 1 may be taught by supervisor(s).
  - No more than 1 may be a reading course.

- **Core CHE courses:**
  - CHE 610 Transport Phenomena
  - CHE 612 Interfacial Phenomena
  - CHE 620 Applied Engineering Mathematics
  - CHE 622 Statistics in Engineering
  - CHE 630 Chemical Reactor Analysis
  - CHE 640 Principles of Polymer Science

Proposed Graduate Studies Academic Calendar content:

- **Courses**
  - Students with a MASc degree must complete CHE 600 (0.25 credit weight) and 3 graduate courses (0.50 unit weight per course) as follows:
    - 3 graduate level elective courses (a minimum of 2 CHE)
    - If CHE 601 and CHE 602 or course equivalents were not taken during MASc studies, electives are reduced and these courses are substituted.
  - 3 must be 600 or 700 level graduate courses.
  - No more than 1 may be taught by supervisor(s).
  - No more than 1 may be a reading course.

- Students without a MASc degree must complete CHE 600 (0.25 credit weight) and 7 graduate courses (0.50 unit weight per course) as follows:
  - CHE 601
  - CHE 602
  - 5 graduate level elective courses of which 2 must be CHE courses.
  - 6 must be 600 or 700 level graduate courses.
  - No more than 1 may be 500 level or held with course.
  - No more than 2 may be taught by supervisor(s).
  - No more than 1 may be a reading course.

- The Chemical Engineering Department may require students to take more than 3 courses. In every case, a graduate course program is established by the supervisor(s) in consultation with the student and, if deemed necessary, with the Associate Chair Graduate Studies of the Department. Students may also be required to take additional courses as a result of a comprehensive examination.

- Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar.

- Only courses taken within five years prior to the completion of the PhD degree may be counted for credit towards a degree, unless a request for revalidation is granted.
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How will students currently registered in the program be impacted by these changes?

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**Departmental approval date** (mm/dd/yy): 05/14/2018

**Reviewed by GSO** (for GSO use only) □ date (mm/dd/yy): 10/03/2018

**Faculty approval date** (mm/dd/yy): 11/20/2018

**Senate Graduate & Research Council (SGRC) approval date** (mm/dd/yy): 

**Senate approval date** (mm/dd/yy) (if applicable):
Graduate Studies
Program Revision Template

Prior to form submission, review the content revision instructions and information regarding major/minor modifications. For questions about the form submission, contact Trevor Clews, Graduate Studies Office.

Faculty: Engineering

Program: Doctor of Philosophy (PhD) in Chemical Engineering - Nanotechnology

Program contact name(s): Nasser M. Abukhdeir

Form completed by: Bettina Wahl/Judy Caron

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Course/Milestone-New/Revision/Inactivation form (PC docx version or MAC docx version).

1. Replacement of core course list with prescribed courses foundational to the discipline.
2. Introduction of mandatory seminar-based (half) course focused on research methods and ethics training

Is this a major modification to the program? Yes

Rationale for change(s):

Changes to meet the objectives of the CHE graduate program:

1. To teach advance fundamental concepts in Chemical Engineering beyond that of undergraduate curriculum.
2. To teach scientific and engineering research methods including research ethics and scholarly communication.
3. To teach graduate-level introductory concepts in specific research areas strategic to the department faculty.

Proposed effective date: Term: Fall Year: 2019

Current Graduate Studies Academic Calendar (GSAC) page (include the link to the web page where the changes are to be made):

https://uwaterloo.ca/graduate-studies-academic-calendar/engineering/department-chemical-engineering/doctor-philosophy-phd-chemical-engineering-nanotechnology

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### Current Graduate Studies Academic Calendar

#### Content:

- **Courses**
- Students with a MASc degree must complete 3 courses (0.50 unit weight per course), including 2 core CHE courses and 1 Nanotechnology Elective course. Within these courses:
  - 2 must be the required NANO core courses, NANO 701 and NANO 702.
  - 1 must be an elective course from the list of Nanotechnology Electives.
  - No more than 1 may be a 500 level or held with course.
  - No more than 1 may be taught by supervisor(s).
  - No more than 1 may be a reading course.
  - Note: Students who have a Bachelor of Applied Science (BASc) or MASc of Applied Science (MASc) in Nanotechnology Engineering from the University of Waterloo are not allowed to take NANO 701 or NANO 702. Instead, they may choose 2 courses from the list of Nanotechnology Electives.
- Students without a MASc degree must complete 7 courses (0.50 unit weight per course), including 4 core CHE courses and 1 Nanotechnology Elective course. Within these courses:
  - 2 must be the required NANO core courses, NANO 701 and NANO 702.
  - 1 must be an elective course from the list of Nanotechnology Electives.
  - No more than 2 may be 500 level or held with courses.
  - No more than 2 may be taught by supervisor(s).
  - No more than 1 may be a reading course.
  - Note: Students who have a Bachelor of Applied Science (BASc) in Nanotechnology Engineering from the University of Waterloo are not required to take NANO 701 or NANO 702. Instead, they may choose 2 courses from the list of Nanotechnology Electives.

- Core courses provide the base knowledge and skill set required to prepare students for more specialized courses and to conduct interdisciplinary nanoscale research. The

### Proposed Graduate Studies Academic Calendar

#### Content:

- **Courses**
- Students with a MASc degree must complete CHE 600 (0.25 credit weight) and 3 graduate courses (0.50 unit weight per course) as follows:
  - NANO 701 (two 0.25 unit sections)
  - NANO 702 (two 0.25 unit sections)
  - 1 graduate level CHE elective course from the list of Nanotechnology Electives
  - If CHE 601 and CHE 602 or course equivalents were not taken during MASc studies, the CHE elective is replaced by CHE 601 and CHE 602.
- 3 must be 600 or 700 level graduate courses.
- No more than 1 may be taught by supervisor(s).
- No more than 1 may be a reading course.
- Note: Students who have a Bachelor of Applied Science (BASc) or MASc of Applied Science (MASc) in Nanotechnology Engineering from the University of Waterloo are not allowed to take NANO 701 or NANO 702. Instead, they may choose any 2 courses from the list of Nanotechnology Electives.
- Students without a MASc degree must complete CHE 600 (0.25 credit weight) and 7 graduate courses (0.50 unit weight per course) as follows:
  - CHE 601
  - CHE 602
  - NANO 701 (two 0.25 unit sections)
  - NANO 702 (two 0.25 unit sections)
  - 3 graduate-level elective courses from the list of Nanotechnology Electives of which 2 must be CHE courses.
- No more than 2 may be taught by supervisor(s).
- No more than 1 may be a reading course.
- Note: Students who have a Bachelor of Applied Science (BASc) in Nanotechnology Engineering from the University of Waterloo are not allowed to take NANO 701 or NANO 702. Instead, they may choose any 2 courses from the list of Nanotechnology Electives.

- Nanotechnology elective courses:
  - (a) Micro/nano Instruments and Devices
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<thead>
<tr>
<th>Current Graduate Studies Academic Calendar content:</th>
<th>Proposed Graduate Studies Academic Calendar content:</th>
</tr>
</thead>
<tbody>
<tr>
<td>following core CHE courses are required for students with no prior nanotechnology degree from Waterloo:</td>
<td>o BIOL 642 Current topics in Biotechnology</td>
</tr>
<tr>
<td>o NANO 701 Fundamentals of Nanotechnology (two 0.25 credit NANO 701 modules)</td>
<td>o CHEM 720 Topic 13 Selected Topics in Analytical Chemistry: Biosensors and Nanotechnology</td>
</tr>
<tr>
<td>o NANO 702 Nanotechnology Tools (two 0.25 credit NANO 702 modules)</td>
<td>o CHEM 750 Topic 17 Selected Topics in Physical Chemistry: Surface Science and Nanotechnology</td>
</tr>
<tr>
<td>Core CHE courses:</td>
<td>o CHEM 750 Topic 23 Selected Topics in Physical Chemistry: Processes at Micro-Nano Scales</td>
</tr>
<tr>
<td>o CHE 610 Transport Phenomena</td>
<td>o ME 738 Special Topics in Materials: Materials for NEMS and MEMS</td>
</tr>
<tr>
<td>o CHE 612 Interfacial Phenomena</td>
<td>o ME 760 Special Topics in Thermal Engineering</td>
</tr>
<tr>
<td>o CHE 620 Applied Engineering Mathematics</td>
<td>o ME 780 Special Topics in Mechatronics</td>
</tr>
<tr>
<td>o CHE 622 Statistics in Engineering</td>
<td>o SYDE 682 Advanced MicroElectroMechanical Systems: Principles, Design &amp; Fabrication</td>
</tr>
<tr>
<td>o CHE 630 Chemical Reactor Analysis</td>
<td>o SYDE 750 Topic 24 Topics in Systems Modelling: Modelling, Simulation and Design of MEMS</td>
</tr>
<tr>
<td>o CHE 640 Principles of Polymer Science</td>
<td></td>
</tr>
<tr>
<td>o CHE 660 Principles of Biochemical engineering</td>
<td></td>
</tr>
<tr>
<td>o NANO 701 Fundamentals of Nanotechnology (two 0.25 credit NANO 701 modules)</td>
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<td>o NANO 702 Nanotechnology Tools (two 0.25 credit NANO 702 modules)</td>
<td></td>
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<tr>
<td>Nanotechnology elective courses:</td>
<td></td>
</tr>
<tr>
<td>o (a) Micro/nano Instruments and Devices</td>
<td></td>
</tr>
<tr>
<td>o BIOL 642 Current topics in Biotechnology</td>
<td></td>
</tr>
<tr>
<td>o CHEM 720 Topic 13 Selected Topics in Analytical Chemistry: Biosensors and Nanotechnology</td>
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</tr>
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</tr>
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<td>o SYDE 750 Topic 24 Topics in Systems Modelling: Modelling, Simulation and Design of MEMS</td>
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<tr>
<td>(b) Nanoelectronics Design and Fabrication</td>
<td></td>
</tr>
<tr>
<td>o CHE 620 Applied Engineering Mathematics</td>
<td></td>
</tr>
<tr>
<td>o CHEM 750 Topic 11 Selected Topics in Physical Chemistry: Bioelectronics</td>
<td></td>
</tr>
<tr>
<td>o CHEM 750 Topic 19 Selected Topics in Physical Chemistry: Carbon Nanotube Electronics</td>
<td></td>
</tr>
<tr>
<td>o ECE 630 Physics and Models of Semiconductor Devices</td>
<td></td>
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<tr>
<td>o ECE 631 Microelectronic Processing Technology</td>
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<tr>
<td>o ECE 632 Photovoltaic Energy Conversion</td>
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<tr>
<td>o ECE 633 Nanoelectronics</td>
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</tr>
<tr>
<td>o ECE 634 Organic Electronics</td>
<td></td>
</tr>
<tr>
<td>o ECE 635 Fabrication in the Nanoscale: Principles, Technology, &amp; Applications</td>
<td></td>
</tr>
<tr>
<td>o ECE 636 Advanced Analog Integrated Circuits</td>
<td></td>
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<tr>
<td>o ECE 637 Digital Integrated Circuits</td>
<td></td>
</tr>
<tr>
<td>o ECE 639 Characteristics &amp; Applications of Amorphous Silicon</td>
<td></td>
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<tr>
<td>o ECE 672 Optoelectronic Devices</td>
<td></td>
</tr>
<tr>
<td>o ECE 676 Quantum Information Processing Devices</td>
<td></td>
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<tr>
<td>o ECE 677 Quantum Electronics and Photonics</td>
<td></td>
</tr>
<tr>
<td>o ECE 730 Topic 10 Special Topics in Solid State Devices: Advanced</td>
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</tr>
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<td>Current Graduate Studies Academic Calendar content:</td>
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<tr>
<td>--------------------------------------------------</td>
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</tr>
<tr>
<td>CHEM 750 Topic 11 Selected Topics in Physical Chemistry: Bioelectronics</td>
<td>Technology for Semiconductor Processing</td>
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<tr>
<td>ECE 630 Physics and Models of Semiconductor Devices</td>
<td>ECE 730 Topic 19 Special Topics in Solid State Devices: Magnetism and Spintronics</td>
</tr>
<tr>
<td>ECE 631 Microelectronic Processing Technology</td>
<td>ECE 730 Topic 26 Special Topics in Solid State Devices: MBE and Quantum Nano Devices</td>
</tr>
<tr>
<td>ECE 633 Nanoelectronics</td>
<td>ECE 730 Topic 29 Special Topics in Solid State Devices: Computational Nanoelectronics</td>
</tr>
<tr>
<td>ECE 634 Organic Electronics</td>
<td>ECE 770 Topic 18 Special Topics in Antenna and Microwave Theory: Nanoelectronics for QIP</td>
</tr>
<tr>
<td>ECE 635 Fabrication in the Nanoscale: Principles, Technology, &amp; Applications</td>
<td>ECE 770 Topic 21 Special Topics in Antenna and Microwave Theory: Quantum Optics &amp; Nanophotonics</td>
</tr>
<tr>
<td>ECE 636 Advanced Analog Integrated Circuits</td>
<td>PHYS 713 Molecular Physics</td>
</tr>
<tr>
<td>ECE 637 Digital Integrated Circuits</td>
<td>PHYS 731 Solid State Physics 1</td>
</tr>
<tr>
<td>ECE 639 Characteristics &amp; Applications of Amorphous Silicon</td>
<td>PHYS 747 Optical Electronics</td>
</tr>
<tr>
<td>ECE 672 Optoelectronic Devices</td>
<td>(c) Nano-biosystems</td>
</tr>
<tr>
<td>ECE 676 Quantum Information Processing Devices</td>
<td>BIOL 608 Advanced Molecular Genetics</td>
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<tr>
<td>ECE 677 Quantum Electronics and Photonics</td>
<td>BIOL 614 Bioinformatics Tools and Techniques</td>
</tr>
<tr>
<td>ECE 730 Topic 10 Special Topics in Solid State Devices: Advanced Technology for Semiconductor Processing</td>
<td>BIOL 629 Cell Growth and Differentiation</td>
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<tr>
<td>ECE 730 Topic 19 Special Topics in Solid State Devices: Magnetism and Spintronics</td>
<td>BIOL 670 Photobiology</td>
</tr>
<tr>
<td>ECE 730 Topic 26 Special Topics in Solid State Devices: MBE and Quantum Nano Devices</td>
<td>BIOL 678 Current topics in Neurophysiology</td>
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<tr>
<td>ECE 730 Topic 29 Special Topics in Solid State Devices: Computational Nanoelectronics</td>
<td>CHE 660 Principles of Biochemical Engineering</td>
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<td>ECE 770 Topic 18 Special Topics in Antenna and Microwave Theory: Nanoelectronics for QIP</td>
<td>CHE 760 Special Topics in Biochemical Engineering</td>
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<tr>
<td>ECE 770 Topic 21 Special Topics in Antenna and Microwave Theory: Quantum Optics &amp; Nanophotonics</td>
<td>CHE 765 Research Topics in Biochemical Engineering</td>
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<tr>
<td>PHYS 713 Molecular Physics</td>
<td>CHEM 737 Enzymes</td>
</tr>
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<td>PHYS 747 Optical Electronics</td>
<td>PHYS 751 Clinical Applications of Physics in Medicine</td>
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<td>PHYS 752 Molecular Biophysics</td>
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<td>(d) Nanomaterials</td>
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  o CHE 622 Statistics in Engineering  
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  o CHE 760 Special Topics in Biochemical Engineering  
  o CHE 765 Research Topics in Biochemical Engineering  
  o CHEM 737 Enzymes  
  o ECE 730 Topic 25 Special Topics in Solid State Devices: Microfluidic & Nanobiotech Systems  
  o PHYS 751 Clinical Applications of Physics in Medicine  
  o PHYS 752 Molecular Biophysics  | • CHE 610 Theory and Application of Transport Phenomena  
  o CHE 612 Interfacial Phenomena  
  o CHE 622 Statistics in Engineering  
  o CHE 630 Chemical Reactor Analysis  
  o CHE 640 Principles of Polymer Science  
  o CHE 641 Physical Properties of Polymers (cross-listed with CHEM 771)  
  o CHE 740 Special Topics in Polymer Science and Engineering  
  o CHE 745 Research Topics in Polymer Science and Engineering  
  o CHE 750 Special Topics in Materials Science: Thin Film Fabrications & Mechanical Properties  
  o CHE 755 Research Topics in Electrochemical Engineering, Interfacial Engineering & Material Science  
  o CHEM 710 Topic 17 Selected Topics in Inorganic Chemistry: Nanostructured Materials and Integrative Chemistry  
  o CHEM 713 Chemistry of Inorganic Solid State Materials  
  o CHEM 720 Topic 14 Selected Topics in Analytical Chemistry: Nanomaterials for Energy Conversion and Clean Environment  
  o CHEM 750 Topic 17 Selected Topics in Physical Chemistry: Surface Science and Nanotechnology  
  o CHEM 770 Principles of Polymer Science  
  o CHEM 773 Topic 11 Selected Topics in Polymer Chemistry: Synthesis, Self-assembly and Materials Application of Inorganic Polymers  
  o CHEM 773 Topic 14 Selected Topics in Polymer Chemistry: Living Polymerization Techniques  
  o CHEM 773 Topic XX Selected Topics in Polymer Chemistry: Noncovalent Interactions & Supramolecular Chemistry  
  o ME 632 Experimental Methods in Materials Engineering  
  o ME 738 Special Topics in Materials: Materials for NEMS and MEMS  
  o ME 738 Topic 8 Special Topics in Materials: Introductory and Advanced Nanomechanics  
  o PHYS 701 Quantum Mechanics 1  
  o PHYS 704 Statistical Physics 1  
  o PHYS 706 Electromagnetic Theory |
| • (d) Nanomaterials  
  o CHE 610 Theory and Application of Transport Phenomena  
  o CHE 612 Interfacial Phenomena  
  o CHE 622 Statistics in Engineering  
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  o PHYS 701 Quantum Mechanics 1  
  o PHYS 704 Statistical Physics 1  
  o PHYS 706 Electromagnetic Theory |
### Current Graduate Studies Academic Calendar

- Energy Conversion and Clean Environment
  - CHEM 750 Topic 17 Selected Topics in Physical Chemistry: Surface Science and Nanotechnology
  - CHEM 770 Principles of Polymer Science
  - CHEM 773 Topic 14 Selected Topics in Polymer Chemistry: Living Polymerization Techniques
  - CHEM 773 Topic XX Selected Topics in Polymer Chemistry: Noncovalent Interactions & Supramolecular Chemistry
  - ME 632 Experimental Methods in Materials Engineering
  - ME 738 Special Topics in Materials: Materials for NEMS and MEMS
  - ME 738 Topic 8 Special Topics in Materials: Introductory and Advanced Nanomechanics
  - PHYS 701 Quantum Mechanics 1
  - PHYS 704 Statistical Physics 1
  - PHYS 706 Electromagnetic Theory
  - PHYS 773 Special Topics

- The Chemical Engineering Department may require students to take more than 3 courses. In every case, a graduate course program is established by the supervisor(s) in consultation with the student and, if deemed necessary, with the Associate Chair Graduate Studies of the Department. Students may also be required to take additional courses as a result of a comprehensive examination.

- Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar.

- Only courses taken within five years prior to the completion of the PhD degree may be counted for credit towards a degree, unless a request for revalidation is granted.

- Students must achieve a:
  - Minimum cumulative average of 70%.
  - Minimum grade of 65% in each individual course.
  - Minimum grade of 70% in each core course.

- Each student is responsible for monitoring their own academic records and must immediately notify their Graduate Coordinator of any inadequate grade or average.

- At least 50% of the final grade in core courses will be determined by a final written exam.

### Proposed Graduate Studies Academic Calendar

- PHYS 773 Special Topics

- Students must achieve a:
  - Minimum cumulative average of 70%.
  - Minimum grade of 65% in each individual course.

- Each student is responsible for monitoring their own academic records and must immediately notify their Graduate Coordinator of any inadequate grade or average.

- At least 50% of the final grade in core courses will be determined by a final written exam.

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**How will students currently registered in the program be impacted by these changes?**

*Current students would be grandfathered under the current requirements.*

**Departmental approval date (mm/dd/yy): 05/14/2018**
Reviewed by GSO (for GSO use only) ☐ date (mm/dd/yy): 10/03/2018

Faculty approval date (mm/dd/yy): 11/20/2018

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):
Prior to form submission, review the content revision instructions and information regarding major/minor modifications. For questions about the form submission, contact Trevor Clews, Graduate Studies Office.

Faculty: Engineering

Program: Doctor of Philosophy (PhD) in Chemical Engineering - Water

Program contact name(s): Nasser M. Abukhdeir

Form completed by: Bettina Wahl/Judy Caron

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the SGRC Course/Milestone-New/Revision/Inactivation form (PC docx version or MAC docx version).

1. Replacement of core course list with prescribed courses foundational to the discipline.
2. Introduction of mandatory seminar-based (half) course focused on research methods and ethics training

Is this a major modification to the program? Yes

Rationale for change(s):

Changes to meet the objectives of the CHE graduate program:

1. To teach advance fundamental concepts in Chemical Engineering beyond that of undergraduate curriculum.
2. To teach scientific and engineering research methods including research ethics and scholarly communication.
3. To teach graduate-level introductory concepts in specific research areas strategic to the department faculty.

Proposed effective date: Term: Fall Year: 2019

Current Graduate Studies Academic Calendar (GSAC) page (include the link to the web page where the changes are to be made):

https://uwaterloo.ca/graduate-studies-academic-calendar/engineering/department-chemical-engineering/doctor-philosophy-phd-chemical-engineering-water

<table>
<thead>
<tr>
<th>Current Graduate Studies Academic Calendar content:</th>
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<tbody>
<tr>
<td>Degree requirements</td>
<td>Degree requirements</td>
</tr>
<tr>
<td>Thesis option:</td>
<td>Thesis option:</td>
</tr>
<tr>
<td>- Graduate Academic Integrity Module (Graduate AIM)</td>
<td>- Graduate Academic Integrity Module (Graduate AIM)</td>
</tr>
</tbody>
</table>
Current Graduate Studies Academic Calendar content:

- **Courses**
  - Students with a MASc degree must complete 5 graduate courses (0.50 unit weight per course).
  - For students with a Chemical Engineering background:
    - At least 2 must be core CHE courses, as listed below.
    - 2 must be core WATER courses, WATER 601 and WATER 602.
    - No more than 1 may be a 500 level or held with course.
    - No more than 2 may be taught by supervisor(s).
    - No more than 1 may be a reading or seminar course.
  - For students with a Non-Chemical Engineering background:
    - 3 must be core CHE courses, as listed below.
    - 2 must be core WATER courses, WATER 601 and WATER 602.
    - No more than 1 may be a 500 level or held with course.
    - No more than 2 may be taught by supervisor(s).
    - No more than 1 may be a reading or seminar course.
  - Students without a MASc degree must complete 8 courses (0.50 unit weight per course). Within these courses:
    - At least 4 must be core CHE courses, as listed below.
    - 2 must be core WATER courses, WATER 601 and WATER 602.
    - No more than 1 may be a reading or seminar course.
    - No more than 2 may be taught by supervisor(s).
    - At least half of the courses for degree requirements must be Chemical Engineering graduate courses.
  - This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602).

Proposed Graduate Studies Academic Calendar content:

- **Courses**
  - Students with a MASc degree must complete CHE 600 (0.25 credit weight) and 3 graduate courses (0.50 unit weight per course) as follows:
    - WATER 601
    - WATER 602
    - 1 graduate level CHE elective course
    - If CHE 601 and CHE 602 or course equivalents were not taken during MASc studies, the CHE elective is replaced by CHE 601 and CHE 602
  - 3 must be 600 or 700 level graduate courses.
  - No more than 1 may be taught by supervisor(s).
  - No more than 1 may be a reading course.
  - Students without a MASc degree must complete CHE 600 (0.25 credit weight) and 7 graduate courses (0.50 unit weight per course) as follows:
    - CHE 601
    - CHE 602
    - WATER 601
    - WATER 602
    - 3 graduate level elective courses of which 2 must be CHE courses.
  - No more than 1 may be a 500 level course.
  - No more than 2 may be taught by supervisor(s).
  - No more than 1 may be a reading course.
  - This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602).
  - Students who have already completed WATER 601 and WATER 602 as part of their Masters Water degree, must complete the following course requirement:
    - 1 graduate level water course from outside the student’s home Faculty agreed to by the student’s Supervisor
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<thead>
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<tr>
<td>perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602).</td>
<td>and the Collaborative Water Program Director.</td>
</tr>
<tr>
<td>• Core Water courses:</td>
<td>• The Chemical Engineering Department may require students to take more than 3 courses. In every case, a graduate course program is established by the supervisor(s) in consultation with the student and, if deemed necessary, with the Associate Chair Graduate Studies of the Department. Students may also be required to take additional courses as a result of a comprehensive examination.</td>
</tr>
<tr>
<td>o WATER 601 Integrated Water Management</td>
<td>o Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar.</td>
</tr>
<tr>
<td>o WATER 602 Integrated Water Management Project</td>
<td>o Only courses taken within five years prior to the completion of the PhD degree may be counted for credit towards a degree, unless a request for revalidation is granted.</td>
</tr>
<tr>
<td>• Core CHE courses:</td>
<td>o Students must achieve a:</td>
</tr>
<tr>
<td>o CHE 610 Transport Phenomena</td>
<td>o Minimum cumulative average of 70%.</td>
</tr>
<tr>
<td>o CHE 612 Interfacial Phenomena</td>
<td>o Minimum grade of 65% in each individual course.</td>
</tr>
<tr>
<td>o CHE 620 Applied Engineering Mathematics</td>
<td>• Each student is responsible for monitoring their own academic records and must immediately notify their Graduate Coordinator of any inadequate grade or average.</td>
</tr>
<tr>
<td>o CHE 622 Statistics in Engineering</td>
<td>o The Chemical Engineering Department will determine whether or not collaborative program courses can be used as electives. It is therefore possible that students will need to take additional courses in order to meet the specific requirements of this program.</td>
</tr>
<tr>
<td>o CHE 630 Chemical Reactor Analysis</td>
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<tr>
<td>o CHE 640 Principles of Polymer Science</td>
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<td>o CHE 660 Principles of Biochemical engineering</td>
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<td>• Students must achieve a:</td>
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<tr>
<td>o 1 graduate level water course from outside the student's home Faculty agreed to by the student's Supervisor and the Collaborative Water Program Director.</td>
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<td>o Minimum grade of 70% in each core course.</td>
<td>• Each student is responsible for monitoring their own academic records and must immediately notify their Graduate Coordinator of any inadequate grade or average.</td>
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<tr>
<td>o Note: Probationary students may have specific grade requirements, which will be specified in their admission letter.</td>
<td>o The Chemical Engineering Department will determine whether or not collaborative program courses can be used as electives. It is therefore possible that students will need to take additional courses in order to meet the specific requirements of this program.</td>
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Current Graduate Studies Academic Calendar content:

- At least 50% of the final grade in core courses will be determined by a final written exam.
- The Chemical Engineering Department will determine whether or not collaborative program courses can be used as electives. It is therefore possible that students will need to take additional courses in order to meet the specific requirements of this program.

Proposed Graduate Studies Academic Calendar content:

How will students currently registered in the program be impacted by these changes?

Current students would be grandfathered under the current requirements.

Departmental approval date (mm/dd/yy): 05/14/2018

Reviewed by GSO (for GSO use only) □ date (mm/dd/yy): 10/03/2018

Faculty approval date (mm/dd/yy): 11/20/2018

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy): 05/14/2018

Senate approval date (mm/dd/yy) (if applicable): 11/20/2018

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11/20/2018
Prior to form submission, review the content revision instructions and information regarding major/minor modifications. For questions about the form submission, contact Trevor Clews, Graduate Studies Office.

Faculty: Engineering

Program: Master of Engineering (MEng) in Chemical Engineering

Program contact name(s): Nasser M. Abukhdeir

Form completed by: Bettina Wahl/Judy Caron

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Course/Milestone-New/Revision/Inactivation form (PC docx version or MAC docx version).

1. Replacement of core course list with prescribed courses foundational to the discipline.
2. Introduction of mandatory seminar-based (half) course focused on research methods and ethics training.

Is this a major modification to the program? Yes

Rationale for change(s):

Changes to meet the objectives of the CHE graduate program (practice-focused):

1. To teach advance fundamental concepts in Chemical Engineering beyond that of undergraduate curriculum.
2. Introduction to professional practice issues (eg. Engineering ethics, tort & contract law, engineering practice in Ontario).
3. To teach graduate-level introductory concepts in specific research areas strategic to the department faculty.

Proposed effective date: Term: Fall Year: 2019

Current Graduate Studies Academic Calendar (GSAC) page (include the link to the web page where the changes are to be made):

https://uwaterloo.ca/graduate-studies-academic-calendar/engineering/department-chemical-engineering/master-engineering-meng-chemical-engineering

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<td>Degree requirements</td>
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<tr>
<td>Coursework option:</td>
<td>Coursework option:</td>
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Current Graduate Studies Academic Calendar content:

- **Graduate Academic Integrity Module (Graduate AIM)**

**Courses**

- Students with a Chemical Engineering background must complete 8 graduate courses (0.50 unit weight per course). Within these courses:
  - At least 2 must be core CHE courses, as listed below.
  - No more than 2 may be 500 level or held with courses.
  - No more than 1 may be a reading course.

- Students with a Non-Chemical Engineering background must complete 8 graduate courses (0.50 unit weight per course). Within these courses:
  - At least 3 must be core CHE courses, as listed below.
  - No more than 2 may be 500 level or held with courses.
  - No more than 1 may be a reading course.
  - At least 5 of the courses for degree requirements must be Chemical Engineering graduate courses.

**Core CHE courses:**

- CHE 610 Transport Phenomena
- CHE 612 Interfacial Phenomena
- CHE 620 Applied Engineering Mathematics
- CHE 622 Statistics in Engineering
- CHE 630 Chemical Reactor Analysis
- CHE 640 Principles of Polymer Science
- CHE 660 Principles of Biochemical Engineering
- NANO 701 Fundamentals of Nanotechnology (two 0.25 credit NANO 701 modules)
- NANO 702 Nanotechnology Tools (two 0.25 credit NANO 702 modules)

**Note:**

Because the Master of Engineering degree does not contain a research component, graduates of this program are not eligible for continuation in the Chemical Engineering Department’s doctoral program.

Proposed Graduate Studies Academic Calendar content:

- **Graduate Academic Integrity Module (Graduate AIM)**

**Courses**

- Students must complete CHE 600 (0.25 credit weight) and 8 graduate courses (0.50 unit weight per course) as follows:
  - CHE 601
  - CHE 602
  - 6 graduate level electives of which 3 must be CHE courses.

- No more than 2 may be 500 level.
- No more than 1 may be a reading course.

- Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar.

- Only courses taken within five years prior to the completion of the MEng degree may be counted for credit towards a degree, unless a request for revalidation is granted.

- Students must achieve a:
  - Minimum cumulative average of 70%.
  - Minimum grade of 65% in each individual course.
  - Note: Probationary students may have specific grade requirements, which will be specified in their admission letter.

- Each student is responsible for monitoring their own academic records and must immediately notify the Graduate Coordinator of any inadequate grade or average.
Current Graduate Studies Academic Calendar content:

- Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar.

- Only courses taken within five years prior to the completion of the MEng degree may be counted for credit towards a degree, unless a request for revalidation is granted.

- Students must achieve a:
  - Minimum cumulative average of 70%.
  - Minimum grade of 65% in each individual non-core course.
  - Minimum grade of 70% in each core course.
  - Note: Probationary students may have specific grade requirements, which will be specified in their admission letter.

- Each student is responsible for monitoring their own academic records and must immediately notify the Graduate Coordinator of any inadequate grade or average.

- At least 50% of the final grade in core courses will be determined by a final written exam.

Proposed Graduate Studies Academic Calendar content:

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How will students currently registered in the program be impacted by these changes?

*Current students would be grandfathered under the current requirements.*

Departmental approval date (mm/dd/yy): 05/14/2018

Reviewed by GSO (for GSO use only) ☐ date (mm/dd/yy): 10/03/2018

Faculty approval date (mm/dd/yy): 11/20/2018

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):
Faculty: Engineering  
Effective term: Term/Year Spring 2019

Course ☒ New ☒ Revision ☐ Inactivation ☐
Milestone ☐ New ☐ Revision ☐ Inactivation ☐

New milestone title: Choose an item.

For course revisions, indicate the type(s) of changes: 
(e.g. consent, description, title, requisites)

Course Subject code: CHE  
Course number: 600
Course Title (max. 100 characters incl. spaces): Engineering and Research Methods, Ethics, Practice, and Law
Course Short Title (max. 30 characters incl. spaces): Eng Res Meth, Eth, Prac, & Law
Grading Basis: Credit/No Credit
Course Credit Weight: 0.25
Course Consent Required: ☐

Course Description: Introduction to methods and ethics relevant to engineering practice and postgraduate research. Literature search and review, defining research problems, planning and communication. Responsible research conduct and laboratory safety. Introduction to non-technical aspects of a professional engineering career, including the Canadian legal framework, profession licensure, ethics, safety and environmental protection.

New course description (for revision only):

Meet Type(s): Seminar  Choose an item. Choose an item. Choose an item.
Primary Meet Type: Seminar
Requisites: Prereq: CHE Grad Students Only, All others require permission of department

Special topics course: Yes ☐ No ☒
Cross-listed: Yes ☐ No ☒

Course Subject(s) to be cross-listed with and approval status:
Sections combined/heldwith:

Rationale for request: Both research and practice-focused graduate students will likely benefit from professional practice information. Consequently, providing training in engineering ethics, practice and law will make the graduate program more desirable and relevant. Additionally, formalizing initial training in research methods and ethics would both benefit research quality and reduce research ethics issues.

Prepared by: Judy Caron  
Date: 15-Aug-18
Faculty: Engineering  
Effective term: Term/Year  Spring  2019

Course ☒ New ☒ Revision ☐ Inactivation ☐
Milestone ☐ New ☐ Revision ☐ Inactivation ☐

New milestone title: Choose an item.

For course revisions, indicate the type(s) of changes: (e.g. consent, description, title, requisites) We would like to de-activate CHE 622/425. We will be proving a new course that is no longer held with. The new course will have a new number and new title.

Course Subject code: CHE  
Course number: 621  
Course Title (max. 100 characters incl. spaces): Model Building and Response Surface Methodology  
Course Short Title (max. 30 characters incl. spaces):  
Grading Basis: NUMERICAL  
Course Credit Weight: 0.50  
Course Consent Required: ☐ Choose an item.

Course Description: Process/product optimization based on design of experiments (DOE), empirical modelling, and non-linear mechanistic models. Response surface methods for investigating process/product performance, determining optimal conditions and designs.

New course description (for revision only):

Meet Type(s): Lecture Lecture Tutorial Choose an item.
Primary Meet Type: Lecture
Requisites:

Special topics course: Yes ☐ No ☒
Cross-listed: Yes ☐ No ☒
Course Subject(s) to be cross-listed with and approval status:  
Sections combined/held with: None

Rationale for request: The Department has indicated that it wishes to have a standalone graduate course, which will provide additional and different content than what has been taught in the past.

Prepared by: Judy Caron  
Date: 15-Aug-18
Faculty: Engineering
Effective term: Term/Year Spring 2019

Course ☒ New ☐ Revision ☒ Inactivation ☐
Milestone ☐ New ☐ Revision ☐ Inactivation ☐

New milestone title: Choose an item.

For course revisions, indicate the type(s) of changes: Revising course number CHE 610 to CHE 601. (e.g. consent, description, title, requisites)

Course Subject code: CHE Course number: 601
Course Title (max. 100 characters incl. spaces): Theory and Application of Transport Phenomena
Course Short Title (max. 30 characters incl. spaces):

Grading Basis: NUMERICAL
Course Credit Weight: 0.50
Course Consent Required: ☐ Choose an item.

Course Description:
Mathematical analysis of momentum, heat and mass transport in systems of chemical engineering interest: development of the differential equations of change (continuity, motion and energy) for forced convection in isothermal, non-isothermal and multi-component systems; description of velocity, temperature and concentration profiles and computation of momentum, energy and mass fluxes at surfaces under conditions of laminar flow; description of transport in turbulent flow by time-smoothing of the equations of change; turbulent velocity, temperature and concentration profiles.

New course description (for revision only):

Meet Type(s): Lecture Choose an item. Choose an item. Choose an item.
Primary Meet Type: Lecture

Requisites:

Special topics course: Yes ☐ No ☒
Cross-listed: Yes ☐ No ☒

Course Subject(s) to be cross-listed with and approval status:

Sections combined/heldwith:

Rationale for request: Renumbering these courses distinguishes the course as foundational.
Faculty: Engineering
Effective term: Term/Year Spring 2019

Course ☒ New ☐ Revision ☒ Inactivation ☐
Milestone ☐ New ☐ Revision ☐ Inactivation ☐

New milestone title: Choose an item.

For course revisions, indicate the type(s) of changes: Revising course number CHE 630 to CHE 602. (e.g. consent, description, title, requisites)

Course Subject code: CHE Course number: 602
Course Title (max. 100 characters incl. spaces): Chemical Reactor Analysis
Course Short Title (max. 30 characters incl. spaces):

Grading Basis: NUMERICAL
Course Credit Weight: 0.50
Course Consent Required: ☐ Choose an item.

Course Description: Mixing effects (segregation and micromixing) on reactor performance analysis of reactor stability, 1D and 2D models for packed bed reactors, heterogeneous non-catalytic reactions, heat and mass transfer effects in porous catalyst particles, reduction of data for catalytic reactions and scale-up concepts. Examples will be drawn from packed, fluidized bed and transport reactors, polymer reactors and 3-phase reactors.

New course description (for revision only):

Meet Type(s): Lecture Choose an item. Choose an item. Choose an item.
Primary Meet Type: Lecture

Requisites:

Special topics course: Yes ☐ No ☒
Cross-listed: Yes ☐ No ☒

Course Subject(s) to be cross-listed with and approval status:
Sections combined/held with:

Rationale for request: Renumbering these courses distinguishes the course as foundational.
Faculty: Engineering
Effective term: Term/Year Spring 2019

Course ☒ New ☐ Revision ☒ Inactivation ☐
Milestone ☐ New ☐ Revision ☐ Inactivation ☐

New milestone title: Choose an item.

For course revisions, indicate the type(s) of changes: New title below, remove cross-listing with CHEM 771 (memo sent to Chemistry), replace calendar description as indicated below, remove Prereq. (e.g. consent, description, title, requisites)

Course Subject code: CHE Course number: 641
Course Title (max. 100 characters incl. spaces): Fundamentals of Polymer Processing Operations
Course Short Title (max. 30 characters incl. spaces):
Grading Basis: NUMERICAL
Course Credit Weight: 0.50
Course Consent Required: ☐ Choose an item.

Course Description:
Introduction to polymer processing concepts; fundamentals of polymer melt rheology; review of simple flows; characterization of mixtures and mixing; handling of particulate polymeric solids; polymer melting operations; modelling of polymer melt pressurization and pumping; overview of polymer extrusion principles; film extrusion operations; design of extrusion dies; polymer compounding and reactive extrusion; overview of molding operations; introduction to 3D printing techniques. Students are expected to have an understanding of concepts from polymer science, fluid mechanics, heat transfer, and applied numerical methods.

New course description (for revision only):

Meet Type(s): Lecture Choose an item. Choose an item. Choose an item. Choose an item.
Primary Meet Type: Lecture

Requisites:

Special topics course: Yes ☐ No ☒
Cross-listed: Yes ☐ No ☒

Course Subject(s) to be cross-listed with and approval status:

Sections combined/held with:

Rationale for request: New Title, new course content, department wishes this course to be taught as a stand alone course.
Faculty: Engineering
Effective term: Term/Year Spring 2019

Course ☒ New ☐ Revision ☐ Inactivation ☒
Milestone ☐ New ☐ Revision ☐ Inactivation ☐

New milestone title: Choose an item.

For course revisions, indicate the type(s) of changes:
(e.g. consent, description, title, requisites) We would like to inactivate CHE 622. We will be proving a new course that is no longer held with. The new course will have a new number and new title.

Course Subject code: CHE Course number: 622
Course Title (max. 100 characters incl. spaces): Statistics in Engineering
Course Short Title (max. 30 characters incl. spaces):
Grading Basis: NUMERICAL
Course Credit Weight: 0.50
Course Consent Required: ☐ Choose an item.

Course Description:
A course in practical statistics at a level one step beyond an elementary course. Material includes regression analysis for linear and nonlinear models, analysis of variance, statistical interference, single and multiple comparisons, and an introduction to the design of experiments including single factor designs, multifactor designs, response surface methods, d-optimality (with empirical and mechanistic models), and the analysis of undersigned data. Applications to process improvement, product development and research problems will be explored. Use of statistical analysis software to apply these techniques.

Prereq: CHE Grad Students Only - All others require permission of department,
Antireq: CHE 425

New course description (for revision only):

Meet Type(s): Lecture Choose an item. Choose an item. Choose an item.
Primary Meet Type: Choose an item.

Requisites:

Special topics course: Yes ☐ No ☐
Cross-listed: Yes ☐ No ☐

Course Subject(s) to be cross-listed with and approval status:
Sections combined/held with: CHE 425
Faculty Achievements

Christine Muschik, Physics and Astronomy and Institute for Quantum Computing (IQC), was awarded a 2019 Alfred P. Sloan Research Fellowship in Physics. Muschik is recognized for her research in quantum networks and quantum simulations, including exploration of the quantum simulation of ‘gauge’ theories that describe the interactions of fundamental particles like quarks and gluons. She hopes to turn this theory into technology by developing practical simulation concepts that might soon be realized in the lab, shedding light into the area of high-energy physics. Muschik is also an Emmy Noether Fellow and affiliate at Perimeter Institute.

CIHR Project Award

David Hammond, School of Public Health & Health Systems, Faculty of Applied Health Sciences received a CIHR Project grant of $2,994,975. The project “International food policy study: Evaluating the impact of food labelling, marketing, and fiscal nutrition policies” will evaluate the impact of national-level policies on dietary patterns and intake. The International Policy Evaluation Study (IFPS) is a prospective cohort study of 16,000 adults, including 4,000 adults in each of four countries: Canada, USA, Australia, and the UK. The IFPS survey and 24-hour dietary recalls will be conducted annually over a 5-year period (2019-2024) to examine changes dietary patterns and policy-relevant behaviours across countries. The project responds directly to the need identified by Health Canada and the WHO for population-level data to evaluate food environment policies. The project would also enhance dietary surveillance in Canada, as the first study to produce national estimates of dietary intake annually over a 5-year period.

Waterloo submitted 20 applications with one award granted. The national funding rate is 15%, however this project was the second largest award granted in the fall competition.

Genome Canada/Ontario Genomics Project

Bin Ma, Cheriton School of Computer Science, Faculty of Mathematics, received a Genome Canada/Ontario Genomics Project grant of $925,987 – the first Genome Canada grant led by Waterloo. His project “Software for Peptide Identification and Quantification from Large Mass Spectrometry Data using Data Independent Acquisition,” in partnership with Michael Moran from the Hospital for Sick Children, explores developing software to enable more sensitive and accurate protein identification and quantification, from mass spectrometry data generated using a method called data independent acquisition (DIA). The software is expected to significantly increase the total number of proteins identified and quantified in comparison to existing DIA analytical software. It will be especially effective with post-translational modifications (PTMs), which are critical to proteins’ function and degradation and, therefore, important biomarkers.
**NSERC Collaborative Research and Development Grant**

Jonathan Price, Geography and Environmental Management, has been awarded a $2.2 million NSERC CRD grant for the project “Fen Creation in the Post Oil Sands Landscape: Phase 2.” The project includes partnerships with Imperial Oil, Suncor & Teck Resources in the amount of $2.9 million. The focus of this project is to evaluate the nature and extent of changes to the ecosystem and use them to predict how the system will function in the future. The group will study how the system functions and how it compares to nearby natural sites. Mathematical models will be developed to predict future behaviour and to refine designs that can function with more efficient use of material and resources, as well as recommend where and how to place these wetlands in the final closure landscape, after a mine lease is completed.

**Renewal of Tri-Agency Financial Administration Guidelines Pilot**

Waterloo continues to implement the Renewal of the Tri-Agency Financial Administration Guidelines pilot. Several changes are now in effect and a new draft of the new principle-based Tri-Agency Financial Administration Guide for the management of research funds was published on February 1.

Waterloo policies and guidelines will be updated as appropriate. Feedback from the pilot institutions will be incorporated into the Guide and a final version will be released to all institutions at the end of the pilot.

More detail about the next steps of the guideline implementation are available on the Renewal of the Tri-Agency financial administration web page: [http://www.science.gc.ca/eic/site/063.nsf/eng/h_97415.html](http://www.science.gc.ca/eic/site/063.nsf/eng/h_97415.html).