



**UNIVERSITY OF TORONTO**  
**FACULTY OF APPLIED SCIENCE & ENGINEERING**

**Meeting of Faculty Council**

**Tuesday, February 27, 2024 from 12:10-2:00 pm**  
**Michael E. Charles Council Chamber (GB202) and Zoom**

**AGENDA**

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|--|--------------------------------|
| <p><b>1. Speaker's Welcome and Approval of Agenda</b><br/> For approval as a regular motion</p>                            | <p>N Yan</p>                   |
| <p><b>2. Introduction of New Faculty</b><br/> Hamed Ibrahim (CivMin)</p>   | <p>M Hatzopoulou</p>           |
| <p><b>3. Adoption of Minutes of Previous Meeting</b><br/> For approval as a regular motion</p>                             | <p>N Yan</p>                   |
| <p><b>4. Memorial Tributes</b><br/> Don Mackay (ChemE), KC Smith (ECE)</p>   | <p>R Farnood<br/> D Kundur</p> |
| <p><b>5. Report of the Dean</b><br/> For information</p>   | <p>C Yip</p>                   |
| <p><b>6. Business Arising: Update on MIE Curriculum Changes</b><br/> For information</p>                                   | <p>E Young</p>                 |
| <p><b>7. Certificate in Electric Vehicle Design (Report 3755R)</b><br/> For approval as a regular motion</p>               | <p>D Aleman</p>                |
| <p><b>8. Major Curriculum Changes, 2024-2025 (Report 3761)</b><br/> For approval as a regular motion</p>                   | <p>E Bentz</p>                 |
| <p><b>9. Sessional Dates for Summer 2024-2025 (Report 3760)</b><br/> For approval as a regular motion</p>                  | <p>E Bentz</p>                 |
| <p><b>10. Information Report</b><br/> To receive for information</p>   |                                |
| <p><b>a. Engineering Graduate Education Committee Update (Report 3762)</b></p>   | <p>L Romkey</p>                |
| <p><b>11. Other Business</b></p>   | <p>N Yan</p>                   |
| <p><b>12. Discussion Item: Engineering Career Centre/Professional Experience Year Co-op Program (PEY Co-op) Update</b></p> | <p>T Coyle<br/> R Francis</p>  |
| <p><b>13. Date of Next Meeting</b></p>   | <p>N Yan</p>                   |
| <p><b>14. Adjournment</b></p>  | <p>N Yan</p>                   |



**UNIVERSITY OF TORONTO**  
**FACULTY OF APPLIED SCIENCE & ENGINEERING**

**Council of the Faculty of Applied Science & Engineering**  
**Minutes of the Meeting of December 7, 2023**

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**MEMBERS:** Ning Yan (Interim Speaker), Chris Yip (Dean), Badr Abbas, Dionne Aleman, Brohath Amrithraj, Julie Audet, Mohammed Basheer, Chris Beck, Timothy Bender, Evan Bentz, Shlomo Bibas, David Boroto, Helen Bright, Markus Bussmann, Arthur Chan, Heba Chehade, Alan Chong, Sinisa Colic, Tom Coyle, Christopher Damaren, Francis Dawson, Michelle Deeton, Matthew Du, Natalie Enright Jerger, Jennifer Farmer, JJ Garcia-Luna-Aceves, Diane Giang, Sarah Haines, Ben Hatton, Marianne Hatzopoulou, Angela Henshilwood, Glenn Hibbard, Ken Hilton, Robert Irish, Greg Jamieson, Charles Q. Jia, Parker Johnston, Shannon Jones, Dawn Kilkenny, Deepa Kundur, Katy Kwong, Freeman Lan, Allison MacKay, Heather MacLean, Gaurika Mahajan, Caitlin Maikawa, Elham Marzi, Katy Mezei, Kasra Modares, Emily Moore, Erika Narimatsu, Jeffrey Packer, Milos Popovic, Adham Ragab, Aryan Rezaei Rad, Jonathan Rocheleau, Lisa Romkey, Cindy Rottmann, Philipp Seiler, Shamim Sheikh, Theodore Soong, David Steinman, Marisa Sterling, Chirag Variawa, John Walker, Lesley Warren, Elizabeth Whitmell

**SECRETARIAT:** Caroline Ziegler (Secretary), Alex Schroen (Moderator), Rodney Gensell (Support)

**GUESTS:** Olenka Baron, Sharon Brown, Leanne Dawkins, Sonia De Buglio, Khuong Doan, Roger Francis, Shilpa Gantotti, Sania Hameed, Christina Heidorn, Andrew Kozak, Denis Mascarin, Teresa Miniaci, Don Newton, Shannon Osborne, Asma Pathan, Dan Pettigrew, Rafael Puello, Zeeshan Rayees, Alex Schroen (Moderator), Frank Scornaienchi, Tristan Tapscott, Gary Tibshirani, Alex Tichine, Geoff Wichert, Nefeteria Wickham

### **1. Speaker's Welcome**

Interim Council Speaker Ning Yan called the second Faculty Council meeting of 2023-2024 to order at 12:10 pm, welcoming Council members in GB202 and online. The Dean and Secretariat introduced themselves. The Speaker acknowledged the land on which the University of Toronto operates, and reviewed protocols for the hybrid meeting.

### **2. Approval of Agenda**

The agenda and reports were distributed on November 22. There was no discussion and on a regular motion duly moved, seconded and carried, the agenda was approved.

### **3. Introduction of New Faculty Members**

New faculty members Jose Joaquin (JJ) Garcia-Luna-Aceves of Electrical & Computer Engineering and Freeman Lan of Biomedical Engineering were introduced by their respective chair and director.

#### **4. Adoption of the Minutes of Previous Meetings**

No errors or omissions were noted in the minutes of the October 31, 2023 Council meeting and on a regular motion duly moved, seconded and carried, the minutes were approved.

#### **5. Memorial Tributes**

##### **(a) Cristiana Amza**

Deepa Kundur, chair of Electrical & Computer Engineering, read the following memorial tribute in honour of Professor Cristiana Amza.

Be it resolved –

THAT the Council of the Faculty of Applied Science & Engineering record with deep regret the death on September 8, 2023 of Professor Cristiana Amza.

Professor Cristiana Amza was born in Bucharest, Romania, in 1968. With her husband Marius, she has two children, Stefan and Gabriela.

Cristiana was driven from an early age by her love for computer science. She graduated from Bucharest Polytechnic University in 1991 and followed her passion across the Atlantic to Rice University in Houston, U.S., where she completed her master's degree in 1997 and her PhD in 2003. She achieved her goal of becoming a professor that same year in The Edward S. Rogers Sr. Department of Electrical & Computer Engineering (ECE) at the University of Toronto, eventually promoted to Full Professor by 2018.

Cristiana's research in distributed systems and cloud computing was internationally acclaimed and widely cited. Her research project called "Treadmarks," published in 1996 is an excellent example of how a simple, clean interface based on well-defined abstractions can provide a powerful and potentially useful parallel system. She was able to implement a "lazy" release consistency model for shared memory on a network of workstations that are not connected by physical memory. Treadmarks made a range of applications more efficient, and it was a natural environment for writing programs. Cristiana also made significant contributions to enhance the efficiency and reliability of cloud-based infrastructure, developing new techniques to optimize resource allocation of computers and networks that maximized performance and minimized costs. She worked towards a cloud infrastructure that could self-manage, self-tune and self-heal for a scalable, diverse range of applications, such as e-commerce, online bidding, neuroscience modelling and multiplayer games.

Over the years, Cristiana received numerous awards and recognitions, including IBM's 2011 CASCON International conference best paper award, the 2008 Middleware Conference best paper award and the 2007 Early Research Award. She collaborated with some of the most influential companies in the industry, including Intel, Bell Canada and IBM.

Cristiana had a special rapport with her students, who thought very highly of her. She was sharp-minded and generous, and during her time in ECE she guided and mentored many to great accomplishments. Professor Khoman Phang observed that her feedback with undergraduates was so gentle, encouraging and positive, it allowed them to relax and absorb what she had to say. Professor Ashvin Goel, who followed her as an instructor of a computer programming course, says, “Her exams in the course were legendary. They helped me understand the course material better!” Professor Mark Jeffrey credits her with a significant impact on his career: “She was one of the first to pique my interest in computer performance,” he says. “Her quiet chuckle at her own jokes was legendary among my peers. We loved it.”

This picture of a kind and selfless person, a genuine friend to many in the department, is repeated again and again by those who knew her. Over the years, conversations extended beyond engineering into the day-to-day joys and struggles of a life in academia, of finding a balance between work and family, always punctuated with Cristiana’s trademark smile. Professor Ding Yuan first met Cristiana when he was a graduate student and she was on his hiring committee the year he was hired. “When I first came to U of T, Cristiana was a mentor and she and her family also helped us in every possible way in our move to Toronto. She was one of the most selfless and kind people I’ve known.”

Professor and Chair, Deepa Kundur reflects on Cristiana’s legacy: “She was a kind, sensitive and gentle soul and a genuine friend to many colleagues in the department. She was incredibly talented, thoughtful and didn’t hesitate to stand up for the underdog.”

Cristiana’s tenacity, her intellectual curiosity, and her friendliness and warmth made her such a beloved colleague. She will be sorely missed.

Be it further resolved –

THAT this tribute to Professor Cristiana Amza be inscribed in the minutes of this Council meeting, and that copies be sent to his family as an expression of the respect and gratitude of the members of this Council.

**(b) James (Jim) Fennel Keffer**

Markus Bussmann, chair of Mechanical & Industrial Engineering, read the following memorial tribute in honour of Professor Emeritus James (Jim) Fennel Keffer.

Be it resolved –

THAT the Council of the Faculty of Applied Science & Engineering record with deep regret the death on September 29, 2023 of Professor Emeritus James (Jim) Fennel Keffer.

A distinguished professor, researcher, teacher and administrator at the University of Toronto, Professor Emeritus Jim Keffer made lasting contributions to fluid mechanics, and heightened the international research profile of U of T during a remarkable career.

Born in 1933, Jim pursued his undergraduate mechanical engineering studies at U of T. Maintaining an honours standing while playing football for the Varsity Blues, Jim was a member of the U of T Hall of Fame team that won the Yates Cup in 1954. After graduating in 1956, Jim joined the research division of Canadian General Electric, which led to his return to U of T for graduate studies. Advised by Professor Doug Baines, Jim obtained his PhD in mechanical engineering in 1962 and then spent two years as a postdoctoral fellow at the Cavendish Laboratory at Cambridge. On his return to Canada, he joined U of T's Department of Mechanical Engineering as an Assistant Professor.

Jim's lifetime of research advanced understanding of fluid mechanics with emphasis on two fundamental shear flows: the wake and the jet. He used novel experimental techniques to investigate these basic flows, which are relevant to environmental problems such as pollutant dispersion, smokestack dispersion, and climate effects. Jim and his students developed rigorous theoretical analyses to support their experimental data and to evaluate their validity and limitations, an important contribution to computer models.

Jim had a keen ability to recognize and plan for the future. Through his efforts, he helped the department and university acquire a unique wind tunnel in the 1970s that remains in use to this day. This facility allowed him to perform sophisticated measurements for the first time and contributed to his widely cited and highly respected work. The quality and significance of his research brought many interested students to his lab. Those under his supervision graduated to become university professors and global industry leaders who continue to contribute to turbulence measurement and analysis.

Jim's roles at U of T extended far beyond the classroom and his lab, as he undertook several administrative positions. He served as the Director of Graduate Studies for Mechanical Engineering, which led to appointments as the Associate Dean at the School of Graduate Studies, and later as Vice-Provost, Professional Faculties. Before retirement, Jim's final appointment was as Vice-President, Research and International Relations. In this role, he firmly established a professional service orientation within the portfolio; made major organizational innovations that his successors have built on to increase U of T's international research profile; and brought the first Cray supercomputer to the campus.

Jim formally retired from U of T in 1999. He and his late wife, Anne, enjoyed their retirement. Summers were spent cruising on their yacht in Georgian Bay; winters were spent in Florida. After Anne passed away in 2015, Jim married Carol Moore-Ede, a family acquaintance of some years. Jim often remarked that he was indeed fortunate to be so lucky twice in one lifetime.

Be it further resolved –

THAT this tribute to Professor Emeritus James (Jim) Fennell Keffer be inscribed in the minutes of this Council meeting, and that copies be sent to his family as an expression of the respect and gratitude of the members of this Council.

The Speaker assumed concurrence with these resolutions and Council observed one minute of silence in honour of Professors Amza and Keffer.

## **6. Report of the Dean**

Dean Chris Yip welcomed all to Council and provided the following remarks.

### **(a) Engineering Career Centre**

The Engineering Career Centre is part of a new tri-campus U of T Co-op partnership. This is a win for the entire institution and is largely driven by the success of the Faculty's Professional Experience Year Co-op Program (PEY Co-op). Congratulations to the PEY Co-op office for a successful year to date, with 98.5 percent of first year students registered in the program and a large increase in the number of participating companies.

### **(b) Recruitment for 2024-2025 Academic Year**

We have reached 10,000 applications, ahead of schedule for the coming year. Close to 3,000 are international students, which is also ahead of target. This is tremendous in terms of application numbers and in the increasing diversity of students' home countries.

### **(c) Financial Constraints**

U of T is financially constrained because of underfunding from the provincial government, a tuition fee reduction of 10 percent in 2019, and a subsequent domestic tuition freeze. A few weeks ago, the university submitted its response to the province's Blue Ribbon Panel on Financial Sustainability in the Post-Secondary Education Sector, asking the government to lift the tuition freeze so that we may address growing financial pressures. The university is advocating for Engineering at municipal and provincial levels through its government relations office regarding the impact of the tuition and salary freezes and the lack of provincial matching to federal money for research.

Notwithstanding these constraints, our Faculty is in a relatively positive financial position because of the number of undergraduate applications we have received and because of our graduate-level teaching.

### **(d) Rhodes Scholars**

Congratulations on the remarkable success of the four U of T students selected as Rhodes Scholars, including fourth-year Engineering Science student Adam Martinez.

### **(e) U of T Aerospace Team**

Congratulations as well to the University of Toronto Aerospace Team (UTAT) which launched the first Canadian satellite fully funded by students. The satellite is being tracked in space from the roof of the Bahen Centre and is tracking the International Space Station.

### **(f) National Day of Remembrance and Action on Violence Against Women**

The university held a memorial event at Hart House Circle on December 6 to honour the National Day of Remembrance and Action on Violence Against Women. The Engineering Society also held a memorial that evening outside the Galbraith Building. Thank you to everyone who attended these events.

**(g) FASE Provostial Review and Self-Study**

Thank you to those who participated in the provostial review of our Faculty earlier this week, whether contributing to the process or sharing their perspectives with the review team. The review team was impressed with our programs and collegiality, and recognized the challenges facing universities at all levels. The provost has also received laudatory feedback from the review team. The review report is expected next week.

**(h) Vaccine Pop-Clinic**

Engineering partnered with the Leslie Dan Faculty of Pharmacy to hold a pop-up vaccination clinic on November 30. For the second consecutive year, our Faculty won best attendance with over 200 doses administered.

**(i) Advancement Updates**

Our 150th Anniversary Open House was a huge success. Thank you to everyone involved in the planning and implementation of the event and thanks to the 800 or so people who attended. The dean and the executive director of advancement recently travelled to Singapore and Hong Kong, where the anniversary celebration continued with the largest alumni event ever held in that country. The strength of our alumni community increases engagement and provides opportunities for placements and internships.

The dean closed by wishing good luck to undergraduate students during their exams and wished all a happy holiday. There were no questions and the speaker thanked the dean for his report.

The following items were endorsed by the Executive Committee of Council at its November 14 meeting and are recommended for Council's approval by regular motions, requiring a simple majority of members present and voting to carry.

**7. Major Curriculum Changes for the 2024-2025 Academic Year**

Evan Bentz, chair of the Undergraduate Curriculum Committee (UCC), presented Report 3759 Revised, which describes curriculum changes affecting various programs and cross-disciplinary minors and certificates in the 2024-2025 academic year.

At the conclusion of the presentation, the following regular motion was moved and seconded –

THAT the proposed curriculum changes for the 2024-2025 academic year, as described in Report 3759 Revised, be approved.

Two errors were noted in the report: ECE286, a proposed prerequisite for the new course MIE3XX, was listed twice and CSC411, an exclusion for MIE3XX, has been re-coded as CSC311. The UCC will update the report accordingly for posting on the Council webpage.

Members discussed the timing of the addition of CSC373 as an exclusion to a MIE245. Because MIE245 is new and will not run until the winter session, and because it appears to have insufficient overlap with CSC373, it was suggested that the exclusion be removed from the UCC

report for re-assessment at a later date. However, because the UCC had identified significant overlap between CSC373 and MIE245 from the course calendar entries, it was recommended that the exclusion remain in the report and that if students feel there is a case for undoing this change after the course has been run, they can take it up with the professor and department then.

Members also discussed the possible impact on enrolment caused by moving MIE504 to the same semester as MIE414, which would result in both fluid mechanics courses being offered in the fall term when there is space for only one technical elective. The UCC chair said the moving of courses is impacted by the availability of professors and students among other factors, and that the professor of MIE504 had requested this change to make the course available to students doing capstone projects.

The UCC chair described the path by which curriculum decisions are made at the local and Faculty levels and the various points at which students can provide feedback. Proposed changes are first discussed and approved by the department or division's curriculum committee. They are then brought to the UCC for discussion and approval. The UCC brings forward a consolidated report on curriculum proposals to the Executive Committee of Council for endorsement, and the report is submitted to Faculty Council for approval, ideally during the fall term so that the changes can be included in the following year's undergraduate calendar.

There are various avenues for student input during this process, ideally before the report is submitted to Council. Local curriculum committees may include student representatives. The UCC membership includes two appointed student representatives plus the Engineering Society vice-president, academic, who is an ex officio member. The Engineering Society president and vice-chair, academic are ex officio members of the Executive Committee. Students who are interested in serving on the UCC or other standing committees can contact the Engineering Society, who makes these appointments. The process for 2024-2025 will begin this March or April.

Members discussed putting a motion to amend Report 3759 Revised to remove the recommendations concerning MIE504 and MIE245 and bringing them forward for approval at a subsequent Council meeting. As this would affect their implementation for 2024-2025, it was subsequently agreed to leave these recommendations in the report. The concerns regarding the MIE courses will be brought back to the department for discussion and an update will be provided at the next Council meeting.

The motion was carried.

## **8. Sessional Dates for Fall 2024-Winter 2029**

Evan Bentz, chair of the Undergraduate Curriculum Committee (UCC), presented Report 3754 Revised. The report describes how, starting in 2024-2025, sessional dates will be aligned among first entry undergraduate divisions at the university, including Engineering, to reduce confusion, improve co-ordination of shared services and ensure consistent terms for students and faculty studying and working across divisions. As a result of this alignment, Fall term classes will start on

the first Tuesday immediately following Labour Day instead of the Thursday of Frosh Week, and Winter term classes will normally be set to start on a Monday. The fall study week will be moved one week earlier, which will further help relieve student stress.

There will be a minimum of 60 instructional days (12 weeks) in a term, excluding Saturdays, Sundays and statutory and university holidays. The UCC proposes that the length of the standard term in Engineering be set at 12.2 weeks to meet CEAB requirements.

We have received tentative approval that the move-in date for the Chestnut Residence and other new residences will be moved a weekend earlier, which will allow the entirety of the following week for Frosh Week and orientation. However, the move-in dates for the affiliated colleges, where a small number of FASE students live, are variable and the effects on them remain to be seen.

Going forward, the UCC will bring forward annual proposals for summer sessional dates only, as these remain within the purview of Faculty Council.

At the conclusion of the presentation, the following regular motion was moved and seconded –

THAT the length of the standard term in Engineering be set at 12.2 weeks, as described in Report 3754 Revised.

Members discussed whether moving the fall study week a week earlier will restrict the time available to instructors to collect and return to students 10 percent of their marks by the drop deadline; however, Council does not vote on annual drop dates. They are set annually by the Registrar's Office which consults with the Undergraduate Assessment and Undergraduate Curriculum committees.

The motion was carried.

## **9. Information Reports**

The following items were approved by the Executive Committee of Council at its November 14 meeting and are recommended for Council's information.

### **(a) Engineering Graduate Education Committee Update**

Lisa Romkey, chair of the Engineering Graduate Education Committee, presented Report 3756 which lists a new course approved, MIE1520: Learning with Graphs and Sequences.

There was no discussion and the report was received for information.

### **(b) Admissions Update**

Sarah Haines, chair of the Undergraduate Admissions Committee (UAC), presented Report 3758, which provides data on applications for admission, offers of admission, registration figures, and characteristics of the 2023 first year class.

A member asked if being ahead of targets helps with our current financial situation. Key for the UAC is how to nail yields so we can stay within three percent plus/minus on domestics.

Members discussed the impact of large class sizes on the number of appeals received. The UAC sets targets in consultation with chairs and the Faculty to ensure targets do not go over a certain amount, causing class sizes to get too large.

Some classrooms are so small that students have been asked to move to online delivery due to insufficient seating. This is not ideal but it is difficult to find rooms large enough to seat 150 students, especially with losses like the large classroom in Lash Miller. The biggest challenge across the university is yield; if we are under on offers, enrolment will be low and the budget will be affected. If we are over, class sizes will explode.

There are not enough TAs in some classes, such as CIV100. The budget for TAs lies with chairs who, in discussion with course instructors, decide how much they can allocate for TA hours. It is a delicate economic balance within units who must ensure there is an appropriate number of hours for TA appointments.

Council discussed grade inflation, as marks remain quite high. We do not apply adjustment factors based on high schools, as some institutions do, because of concerns about equity. Instead, we use broad-based admissions. Students have been consistently strong, even during Covid, and any grade inflation that happened then is starting to decline.

Members also discussed the declining running average of female enrolment, which is now at 40 percent. The UAC is working with departments to try to maintain or increase this percentage but the challenge is mainly yield; offers are made but are not being accepted. The registrar noted that our yield on female students admitted from overseas is lower. The committee is working with Outreach to identify ways to reach more female students, such as promoting engineering at Ontario high schools.

The UAC is looking into expanding what is being tracked, such as additional equity-related statistics on people of colour and marginalized communities. The registrar added that the equity-related data already collected is not tied to the application process.

Regarding whether the proportion of professors on sabbatical in a given year affects admissions, the biggest challenge is for chairs to balance the running cycle of sabbaticals in their departments so that the teaching of courses is likewise balanced.

The report was received for information.

## **10. Other Business**

There was no other business.

**11. Date of Next Meeting**

The next Faculty Council meeting is on February 27, 2024.

**12. Adjournment**

The Speaker wished students good luck with their exams, and all a happy holiday.

The meeting was adjourned at 1:55 pm.

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**UNIVERSITY OF TORONTO**  
**FACULTY OF APPLIED SCIENCE & ENGINEERING**

**Memorial Tribute to**

**DONALD MACKAY**

**Professor Emeritus**  
**Department of Chemical Engineering & Applied Science**

**February 27, 2024**

Be it resolved –

THAT the Council of the Faculty of Applied Science & Engineering record with deep regret the death on October 20, 2023 of Professor Emeritus Donald Mackay.

Professor Mackay grew up in Glasgow, Scotland, and entered Chemical Engineering at the Royal Technical College in Glasgow in 1954, graduating with a BSc in 1958 and PhD in 1961. He and his wife Ness met in Toronto when he started what would become an almost 30-year working career at the Department of Chemical Engineering & Applied Chemistry here at the University of Toronto — first working as a postdoctoral fellow with Professor Olev Trass and eventually earning his appointment as Professor in 1967.

In the early stages of his career, he spent many summers conducting research on the behaviour and remediation of oil spills in the Arctic. Some of these experiences were later reflected in his hobby of soapstone carving. His later research focused on developing a better understanding and representation of the environmental behaviour of toxic substances.

Through the course of his illustrious career, Professor Mackay authored numerous books and over 650 scientific research papers. He developed the fugacity-based "Mackay Models," which provided valuable insight into the behaviour of chemicals in the natural environment, as well as a framework for understanding their transport and degradation. These models are still used to help guide regulatory and environmental policy decisions worldwide.

In 1995, he left U of T to pursue the role of Founding Director of the Canadian Environmental Modelling Centre at Trent University in Peterborough. In 2001, he was the first Canadian recipient of the prestigious Honda Prize for his work on eco-technology. He received the title of Professor Emeritus in 2002 from both U of T and Trent. In 2003, he was appointed Officer of the Order of Canada, followed by the Order of Ontario a year later.

Throughout his life, Professor Mackay was relentlessly curious and had a passion for both nature and travel. He had the good fortune to have explored many regions of the world, from pole to pole. He was a beloved teacher, colleague, mentor and friend who is remembered for his wonderful sense of

humour and ability to distill complex concepts into memorable lessons. His research has left a tremendous legacy within our Faculty and Department, and his work has undoubtedly made the world a safer and cleaner place for all.

Be it further resolved –

THAT this tribute to Professor Emeritus Donald Mackay be inscribed in the minutes of this Council meeting, and that copies be sent to his family as an expression of the respect and gratitude of the members of this Council.



**UNIVERSITY OF TORONTO**  
**FACULTY OF APPLIED SCIENCE & ENGINEERING**

**Memorial Tribute to**

**KENNETH CARLESS (K.C.) SMITH**

**Professor Emeritus**

**The Edward S. Rogers Sr. Department of Electrical & Computer Engineering**

**February 27, 2024**

Be it resolved –

THAT the Council of the Faculty of Applied Science & Engineering record with deep regret the death on October 29, 2023 of Professor Kenneth Carless Smith.

Professor Kenneth Carless Smith — known to friends and colleagues as “K.C.” — was born in Toronto in 1932. He is survived by his wife and life partner of 40 years, Laura Chizuko Fujino, sons Kenneth David Smith and Kevin Anthony Smith, both alumni of U of T Engineering, and granddaughter Sophia Moore Smith.

After graduating from Lawrence Park Collegiate in 1950, Professor Smith joined the Engineering Physics program (now known as Engineering Science). Upon graduation he embarked on an MASC and later a PhD, both from the University of Toronto.

Professor Smith joined U of T’s Department of Electrical Engineering, now The Edward S. Rogers Sr. Department of Electrical & Computer Engineering (ECE), as an Assistant Professor in 1960 before leaving for the University of Illinois where he became an Associate Professor.

At the University of Illinois, he was a member of the design team and later chief engineer of the *Illiack II* and *Illiack III* computers. Here, Professor Smith recognized that with the need to design complex transistor circuits, heavily physics-based models were too cumbersome. In response to this challenge Professor Smith developed simple and intuitive transistor models that could be used in the rapid design of complex circuits.

When he returned to U of T, where he reached the rank of Full Professor, Professor Smith used these simple models and design approaches in a highly innovative course on digital circuit design. This course was taught to generations of graduate students, helping to position ECE at U of T as an international leader in circuit design. Professor Smith notably co-invented, along with Professor Adel Sedra — K.C.’s former graduate student — the current conveyor: a groundbreaking circuit component akin to an operational amplifier.

In 1982 with Professor Sedra, he coauthored a seminal textbook called *Microelectronic Circuits*. Better known as Sedra/Smith, this book established a new way for teaching electronic circuits to undergraduate engineering students. Sedra/Smith has been translated into ten languages and is currently in its eighth edition. With more than one million copies in print, it remains the most widely used textbook on the subject.

“K.C. was well known for his eloquent and insightful speech. I specifically recall an occasion where he held forth on the multiple levels of abstraction in electrical engineering. He described how we connect and traverse a vast knowledge hierarchy, spanning from quantum mechanics in transistors to the complexities of global communication networks. It profoundly impacted and inspired me as a young engineer. I continue to draw on that idea in my teaching and research.” said Professor Tony Chan Carusone, who co-authored the 8th edition of Sedra/Smith in 2020.

Professor Smith’s gift of simplifying the abstract, as well as his articulacy and ability to make connections, served him well in his research and teaching as well as in various administrative roles both in the University and through his professional organizations. He served as Chair of ECE from 1976 to 1981 and was the Chair of the Engineering Science Advisory Board from 2012 until his passing. “K.C. brought not just his insightful perspectives, but also a generous spirit that uplifted us all,” said Professor Deepa Kundur, who served as Chair of Engineering Science from 2017 to 2019 and currently serves as Chair of ECE, “His dedication to EngSci and ECE was unwavering and wisdom profound.” After he retired, he remained actively involved with both the University of Toronto and the International Solid-State Circuits Conference (ISSCC).

At ISSCC meetings, “K.C. would always listen to all sides on any debate, recognize the pros and cons in everyone’s arguments, then come back with the most convincing argument that all sides would agree on. This was a true characteristic of K.C.,” said Professor Ali Sheikholeslami.

It would be difficult to find a person with a larger or longer lasting presence and impact in the ECE department and in the IEEE Solid-State Circuits community than Professor Smith. “He was an engineer’s engineer, a circuit designer par excellence, and a man with deep insights, simply expressed,” said Professor Safwat Zaky.

Be it further resolved –

THAT this tribute to Professor KC Smith be inscribed in the minutes of this Council meeting, and that copies be sent to his family as an expression of the respect and gratitude of the members of this Council.

*Prepared by Professor and Chair Deepa Kundur, and Professors Tony Chan Carusone, Jonathan Rose, Adel Sedra, Sorin Voinigescu, Safwat Zaky, Steve Mann, Belinda Wang, Antonio Liscidini, Bruno Korst, Ali Sheikholeslami, Hoi-Kwong Lo, Berj Bardakjian, Khoman Phang, Ali Sheikholeslami, and Natalie Enright Jerger*



**UNIVERSITY OF TORONTO**  
**FACULTY OF APPLIED SCIENCE & ENGINEERING**

**Report No. 3755R**

**MEMORANDUM**

**To:** Executive Committee of Faculty Council (February 5, 2024)  
Faculty Council (February 27, 2024)

**From:** Professor Dionne Aleman  
Associate Dean, Cross-Disciplinary Programs

**Date:** January 23, 2024

**Re:** **Creation of a Certificate in Electric Vehicle Design**

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**REPORT CLASSIFICATION**

This is a major policy matter that will be considered by the Executive Committee for endorsement and forwarding to Faculty Council for vote as a regular motion (requiring a simple majority of members present and voting to carry).

**BACKGROUND**

In recent years, electric vehicles (EVs) have become viable and popular alternatives to traditional internal combustion engines for passenger vehicles, and even for commercial applications and other motorized equipment. Engineering as a discipline is well-positioned to advance EV technology.

Mechanical, industrial, electrical, computer, chemical, and materials science engineering principles are all relevant to future development of EV technology. Creating sustainable and thriving global communities through technologies that meet the climate crisis head-on, such as new ways of reducing demand for oil and gas, relates to the academic priorities of the Faculty of Applied Science & Engineering.

**PROPOSED**

A certificate in EV design is proposed to provide students in the Core-8 engineering programs and Engineering Science with exposure to the numerous ways that engineering applies to EV design, batteries, manufacture, and logistics. The certificate provides an opportunity for students to learn about EVs within the context of engineering applications and expand their understanding of the technical and environmental implications of engineering in EV design.

**CONSULTATION PROCESS**

The proposal for a Certificate in Electric Vehicle Design was developed by the FASE Electric Vehicle working group with consultation from representatives from MIE, ECE, CHE, MSE, and

CIV/MIN. It has been reviewed by and/or received input from the Faculty's Cross Disciplinary Programs Office and members of the FASE Undergraduate Curriculum Committee.

The Undergraduate Curriculum Committee is composed of representatives from each program, the Vice-Dean, Undergraduate, the Vice-Dean, First Year Studies, the Associate Dean, Cross-Disciplinary Programs, and the Registrar. The Committee meets regularly, and reviews changes to the curriculum.

**RECOMMENDATION FOR COUNCIL**

THAT the Certificate in Electric Vehicle Design be approved, effective September 2024, as described in Report 3755 Revised.

# University of Toronto

## Proposal to Create a Certificate in Conjunction With an Undergraduate Program

For-credit undergraduate certificates (category 2) are offered in conjunction with an existing undergraduate degree program. They are governed by the [Policy for Certificates \(For-Credit and Not-For-Credit\)](#) and follow the protocols for approval and closure for [minor modifications](#) under the [University of Toronto Quality Assurance Process \(UTQAP\)](#).

<b>Proposed certificate name:</b>	<b>Certificate in Electric Vehicle Design</b>
<b>Undergraduate degree(s) the certificate will be offered in conjunction with:</b>	<i>Any Engineering Bachelor's Degree (BASc or BASc in Engineering Science)</i>
<b>Faculty/academic division:</b>	<i>Applied Science &amp; Engineering (FASE)</i>
<b>Unit:</b>	<i>Cross-Disciplinary Programs Office, FASE</i>
<b>Dean's Office contact:</b>	<i>Dionne Aleman, Associate Dean, Cross Disciplinary Programs Caroline Ziegler, Faculty Governance and Programs Officer</i>
<b>Version date:</b>	<i>January 23, 2024</i>

### 1 Summary

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In recent years, electric vehicles (EVs) have become viable and popular alternatives to traditional internal combustion engines for passenger vehicles, and even for commercial applications and other motorized equipment. Engineering as a discipline is well-positioned to advance EV technology. A Category 2 certificate in EV design is proposed to provide students in the Core-8 engineering programs and Engineering Science with exposure to the numerous ways that engineering applies to EV design, batteries, manufacture, and logistics. This program will provide students with an introduction to EV studies that might spark an interest to explore careers or graduate programs in the area of EV.

### 2 Effective Date

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September 1, 2024

### 3 Academic Rationale

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Mechanical, industrial, electrical, computer, chemical, and materials science engineering principles are all relevant to future development of EV technology. Creating sustainable and thriving global communities through technologies that meet the climate crisis head-on, such as new ways of reducing demand for oil and gas, relates to the academic priorities of the Faculty of Applied Science & Engineering. This certificate introduces EV design principles to engineering students to better prepare them for professional practice, and also to highlight an opportunity for future graduate studies. Many engineering courses already include aspects of EV design, as evidenced by the existing engineering electives within the proposed program. The certificate provides an opportunity for students to learn about EVs within the context of engineering applications and expand their understanding of the technical and environmental implications of engineering in EV design.

### 4 Need and Demand

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Although the certificate will be open to any engineering discipline, we anticipate that it will likely appeal most to students in mechanical, electrical, chemical, materials science, and industrial engineering, as well as engineering science.

We anticipate an initial enrolment in the core course of about 75-100 students. Completion of the certificate will depend on availability of, and student interest in, the courses connected to the certificate.

The certificate is motivated by strong demand both from industry and students. Initial consultation in 2021 with Honda of Canada, as well as Oakville Ford, led to proposals for the lab spaces that form the backbone of the proposed “Introduction to EV Design” course. Further consultation directly guided the course contents around manufacturing and design.

Students have also provided direct feedback on the certificate, including the proposed APS380H1 course. In 2021 and 2022, MIE tracked and categorized questions about the ME and IE programs from potential incoming students. For both years, over 60% and 65% of the questions for 2021 and 2022 respectively related to EVs in some manner, mostly (1) do we offer formal courses in EVs, and (2) how do our programs lead to jobs in this sector. In 2022, a draft of a proposed minor in EVs (a subset of which was used to

build this certificate) was shown to undergraduate student focus groups, composed of third- and fourth-year students in the MIE program in relevant streams (Energy, Mechatronics, Solid Mechanics). Of the 40 participants, all but two ranked the minor as “would likely complete” or “would definitely complete”; it is reasonable to assume a similar favorable opinion exists about a certificate in the same topic. Groups shared direct feedback: “EV courses are a must-have”, “I went into MIE specifically to work at Tesla”, “I wish we had these courses already available”. Within ECE, the area of electric vehicles has been identified as one of the priorities in the latest departmental strategic plan. ECE has invested in new lab infrastructure to satisfy the demand for EV related courses. ECE’s curriculum visualization tool, Iris, already highlights a number of ECE courses that touch on EV-specific content.

More recently, the final certificate proposal and APS380H1 draft syllabus were shown to 10 fourth-year MIE students for informal comments. One noted: “I wish we had something like this that we could put on our CVs now...” [Speaking about Tesla and US auto companies]: “It has been really hard to compete in the US. Their undergraduate programs have more focus on EVs and new labs. This would help us compete.” Another noted: “I really like the APS course. I didn’t know there was so much materials and chemistry involved... it’s really cool to see stuff from other departments, we don’t get much of that.” [Speaking about the MEng]: “I hope we could get some courses like this that I could take next year too.”

## 5 Admission Requirements

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There are no admission requirements for engineering certificate programs. The certificate is open to all undergraduate students in any engineering discipline. Successful completion of the certificate by an eligible student will be recorded on the student’s academic transcript as part of their undergraduate program.

## 6 Program Requirements

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The certificate consists of three half-course requirements, totaling 1.5 FCE. The courses can be completed as part of the elective credits in a student’s program or taken as Extra credits (not counting towards their degree requirements).

While the certificate is technically open to any student who completes the courses, the program fits well (no overload courses required) for students in Chemical Engineering,

Electrical and Computer Engineering, and Materials Engineering. The program would currently require students in the following programs to take APS380H1 as an overload (or elective substitution) – Mechanical Engineering, Industrial Engineering and Engineering Science Majors in ECE, Robotics, and Energy Systems. Future curriculum adjustments in those programs may add APS380H1 as an elective option for their students, eliminating the need to overload.

Students in Civil and Mineral Engineering and the other Engineering Science Majors do not at this time have viable course paths to complete the program.

**Mandatory Course:**

- APS380H1 - Introduction to Electric Vehicle Design ( (New course) This course is jointly run by MIE, ECE, CHE and CIV/MIN. The curriculum provides a broad overview of EV design and infrastructure issues and is designed to be accessible by students from all disciplines.

**One of the following courses:**

- MIE535H1: Electrification Through Electricity Markets (IND)
- MIE346H1: Analog and Digital Electronics for Mechatronics (MEC)
- MIE366H1: Electronics for Robotics (EngSci)
- ECE314H1: Fundamentals of Electrical Energy Systems (ECE)
- ECE349H1: Introduction to Energy Systems (EngSci)
- CHE469H1: Fuel Cells and Electro-chemical Conversion Devices (CHE)
- MSE458H1: Nanotech in Alternate Energy Systems (MSE)

**One of the following courses:**

- MIE363H1: Operations and Supply Chain Management (IND)
- MIE304H1: Introduction to Quality Control (MEC, IND)
- MIE404H1: Control Systems I (MEC)
- MIE515H1: Alternative Energy Systems (MEC)
- MIE443H1: Mechatronics Systems: Design and Integration (MEC)
- MIE444H1: Mechatronics Principle (MEC)
- ROB521H1: Mobile Robotics and Perception (EngSci)
- AER525H1: Robotics (EngSci)
- MIE519H1: Advanced Manufacturing Technologies (MEC)
- MSE443H1: Composites Materials Engineering (MSE)
- ECE311H1: Introduction to Control Systems (ECE)
- ECE342H1: Computer Hardware (ECE)

- ECE356H1: Introduction to Control Systems (ESC)
- ECE427H1: Photonic Devices (ECE)
- ECE463H1: Electric Drives (ECE)
- ECE470H1: Robotics (ECE)
- ECE520H1: Power Electronics (ECE)
- CHE507H1: Data-based Modelling for Prediction and Control (CHE)
- Relevant capstone or thesis project (H or Y)

## 7 Consultation

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This certificate proposal was developed as a first phase of the creation of an EV minor, which has been under development since 2021.

The core course and curriculum of the certificate were developed through discussions with a subset of the FASE Electric Vehicle working group, including:

- Mathew Mackay – MIE
- Olivier Trescases - ECE
- Sanjeev Chandra – MIE
- Cristina Amon – MIE
- Sinisa Colic – MIE
- Ronald Venter – MIE
- Tomas Bernreiter – MIE
- Xinyu Liu – MIE

As part of the curriculum development process, the proposal has also been reviewed by and/or received input from:

- Chris Yip – Dean
- Dionne Aleman – Associate Dean, Cross-Disciplinary Programs
- Sharon Brown – Assistant Director, Cross-Disciplinary Programs Office
- Peter Lehn - ECE Energy Systems Group
- Daniela Galatro – Designate for CHE
- Sebastian Goodfellow – Designate for CIV/MIN
- Amy Bilton – Designate for ESC
- Scott Ramsay – Associate Chair, Undergrad, MSE
- Agnes Hsin – Undergraduate Liaison Officer, MSE
- Will Cluett – Associate Chair, Undergraduate Curriculum Development, CHE
- Mechanical Engineering fourth-year students

The course and proposal received endorsement by the FASE Undergraduate Curriculum Committee on November 1, 2023. Following consultations at the FASE Executive

Committee meeting on November 14, the proposal was recommended to have further consultation with the departments before proceeding. The updated proposal was returned to the Undergraduate Curriculum Committee who again endorsed it on January 16, 2024.

## 8 Resources

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Administration of the certificate program will be managed through the Cross-Disciplinary Programs Office as part of its regular activities. No additional resources will be required for the administration of the certificate.

The new course, APS380, will require significant resources for laboratories and TA's. A MOU is under development between ECE and MIE to ensure the long-term viability of the new course and certificate. The MOU will include agreements on content development, hosting labs and course delivery.

## 9 Oversight & Accountability

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Minors and certificates in the Faculty of Applied Science & Engineering are subject to periodic review in conjunction with the review of the Cross-Disciplinary Programs Office.

## 10 Summary of Process Steps & Approvals

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<b>Steps</b>	<b>Dates</b>
<i>Development/consultation within CDPO</i>	<i>July-October 2023</i>
<i>Endorsement by Undergraduate Curriculum Committee</i>	<i>November 1, 2023</i>
<i>Consultation with Dean's Office and VPAP</i>	<i>November 2023</i>
<i>Consultation with FASE Executive Committee</i>	<i>November 14, 2023</i>
<i>Revised proposal endorsed by Undergraduate Curriculum Committee</i>	<i>January 16, 2024</i>
<i>Endorsed by FASE Executive Committee</i>	<i>February 5, 2024</i>
<i>Approval of FASE Council</i>	<i>February 27, 2024</i>
<i>Submission to VPAP upon approval</i>	<i>February 2024</i>
<i>Reported by VPAP to AP&amp;P</i>	<i>June 2024</i>

## Appendix A: Proposed Learning Outcomes and Undergraduate Degree-Level Expectations

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The Faculty of Applied Science & Engineering aims to provide all of its undergraduate students with an education that will encourage them to be leaders in society in developing solutions to its most pressing problems. In order to achieve this, each graduate will have achieved the Undergraduate Degree-Level Expectations for the BASc described below.

Engineering minors and certificates are designed to recognize students for focusing their degree-program electives in a particular area of study. They are optional structures above and beyond a student's degree requirements and are therefore enhancements to existing rigorous degree-level expectations for engineering programs.

The certificate is structured around a broad, interdisciplinary introduction to the field of EV design and its constituent elements.

The foundational course, APS380H1: Introduction to Electric Vehicle Design, will provide an enhanced examination of EV concepts which goes beyond the content that is already found in our existing engineering curriculum. The course will cover major pillars of EV design and implementation, including EV design, manufacturing, powertrain, energy management, EV's and society and future directions.

In addition to the following Undergraduate Degree-Level Expectations, upon completion of the certificate program, students will be able to:

1. Understand the major components of electrified vehicles-principle, current status, technology outlook.
2. Explain the role of electric vehicles in the clean-energy transition and evaluate the challenges of integrating electrified vehicles into the electric grid.
3. Understand core EV sub-systems, battery technologies including lithium-ion batteries, battery management, battery capacity, power electronics, charging technologies and aging factors, thermal management of battery and power systems.
4. Augment domain-specific knowledge with cross-disciplinary courses and electives.

## Degree Level Expectations for Graduates Receiving the Degree of Bachelor of Applied Science

### Faculty of Applied Science and Engineering University of Toronto

#### 1. Degree Learning Objectives and Requirements

##### Overall Learning Objectives

The Faculty of Applied Science and Engineering aims to provide all of its undergraduate students with an education that will allow them to be leaders in society in developing solutions to its most pressing problems. Our graduates will be able and inspired to:

- be leading practitioners of engineering and engineering design
- be known for their technical literacy as well as their knowledge of mathematics and the basic sciences and the role of technology in society
- be able to formulate and solve problems in complex systems independently and in teams
- pursue independent lifelong learning within their field of study and more broadly
- be prepared for careers, including graduate programs, that build upon their advanced technical knowledge
- participate meaningfully as leaders in society

In order to achieve this, each graduate will have achieved the following general learning objectives:

- a. Depth of knowledge that cultivates critical understanding and intellectual rigour in at least one engineering discipline.
- b. Competencies in learning and applying knowledge to solve problems facing society and that are fundamental to responsible and effective participation in the workplace, in the community, in scholarly activity, and in personal life:
  - i. Critical and Creative Thinking
  - ii. Oral and Written Communication
  - iii. Quantitative Reasoning
  - iv. Teamwork
  - v. Information Literacy
  - vi. Ethical Thinking and Decision-Making
- c. Breadth of knowledge across mathematics, basic sciences, engineering sciences, engineering economics and engineering design that cut across the engineering disciplines and across a range of nontechnical areas including the humanities and social sciences and an awareness of the impact of technology on society.
- d. Integration of skills and knowledge developed in a student's course of study through a capstone experience in the upper years.

## 2. Requirements to Graduate

In order to graduate with a BASc degree, each student in the Faculty of Applied Science and Engineering will have completed a full undergraduate program as outlined in the Faculty Calendar within nine calendar years of first registration, exclusive of mandatory absences from his/her program. Current programs include: Chemical, Civil, Computer, Electrical, Industrial, Mineral, Materials and Mechanical Engineering as well as the BASc in Engineering Science.

The practice of engineering is regulated, by statute, in all Canadian provinces and territories. To become a Professional Engineer (PEng), an individual must satisfy the requirements of the licensing bodies.

These requirements include a degree from an accredited program, successful completion of a professional practice examination in engineering law and ethics, and suitable experience. At present, all programs in the Faculty of Applied Science and Engineering are accredited and evaluated regularly by the Canadian Engineering Accreditation Board (CEAB) of the Canadian Council of Professional Engineers. Therefore, graduation from the Faculty may lead to registration in the provincial Associations of Professional Engineers, in accordance with individual policies. No student will be permitted to graduate who does not meet these requirements.

The criteria set out by the CEAB are designed to ensure that each graduate has a foundation in Mathematics and Basic Sciences, a broad preparation in Engineering Sciences and Engineering Design and an exposure to non-technical subjects (Complementary Studies) that complement the technical aspects of the curriculum. Basic Sciences must include physics and chemistry and also may include elements of life sciences and earth sciences; they impart an understanding of natural phenomena. Engineering Sciences normally involve Mathematics and Basic Sciences but carry knowledge further to creative applications. Complementary Studies include the humanities, social sciences, arts, management, engineering economics and communication skills.

Each program in the Faculty consists of a technical component and complementary studies component. The curriculum for students in their early years forms a basis in the fundamental subjects prior to subsequent specialization in the various engineering disciplines. Students are able to choose from a range of technical electives in their senior years. In the senior years, all programs contain a capstone experience through a design project, which integrates their skills and knowledge and provides students with the opportunity to carry out original work in their chosen fields of study.

There are a set of common requirements, described below, that cut across all programs in the following categories: Coursework, Promotion, English Proficiency, and Practical Experience. In this context, a course is defined as one half-course equivalent, which may consist of a half course ("S," "F" or "H") or half of a full-year "Y" course.

1. **Coursework:** Each program will have courses that provide the following:
  - a. Complementary Studies Electives
  - b. A basic knowledge of Engineering Economics
  - c. Technical Electives
  - d. Courses with substantial design content in Years 1, 2 and/or 3

- e. Capstone course(s) in Years 3 and/or 4 with strong integrative, design and independent work elements
  - f. Across all four years, programs will provide sufficient opportunities for the development of professional awareness and practice.
2. **Promotion:** All undergraduate programs will consist of eight Fall and Winter Sessions taken in order.
- a. To gain credit for a session a student must:
    - i. satisfy the academic regulations to proceed to the succeeding session as described in the calendar and
    - ii. not be subsequently required to repeat the session for which credit is to be gained, and
    - iii. achieve a course mark of 50% or greater in every course taken as part of the academic load in a session, and
    - iv. not have any outstanding designations of 'standing deferred,' 'incomplete' or 'No Grade Available' for any course in any session.
  - b. To be eligible to graduate, each student must attain a weighted Session Average of 60% or greater in the final session of their program. Any student who does not achieve a weighted Session Average of 60% in their final session (4W), but has attained a weighted Session Average that allows them to proceed to the next session on probation, shall repeat the final session and achieve a weighted Session Average of 60% or greater to graduate.
3. **English Proficiency:** Each student must show an ability to write English coherently and correctly. Every student will also take at least one course that includes a written communication component within their curriculum. Satisfactory completion of the course or courses is required for graduation.
4. **Practical Experience:** The Faculty requires that all students complete a minimum of 600 hours of practical work before graduation.

### 3. Degree Level Expectations for the Bachelor of Applied Science

#### 1.1. Depth and Breadth of Knowledge

The Faculty ensures that a student has mastered a body of knowledge with appropriate depth by requiring that each student completes the requirements of one of the degree Programs of Study (POST) as described in the Faculty Calendar. The curriculum for students in First Year forms a common basis in the fundamental subjects, including the natural sciences and mathematics, prior to a subsequent specialization in the various engineering disciplines. Each program consists of a technical component and a complementary studies component.

Critical analysis and thinking and analytical skills are emphasized through the student's exposure to an increasingly sophisticated understanding of their program of study. Specialization within the discipline is developed through technical electives taken in the 3rd and 4th years of study. A detailed knowledge of and experience in design is ensured through the Design Course requirements, beginning with courses in the first three years as well as the

Capstone course(s) in each program. Opportunity to further develop these skills is provided through a research thesis that is available in most POSTs.

The Faculty assures that students have breadth of knowledge in a number of ways. Breadth across engineering is assured through a First Year of study that prepares a student for any of the programs of study. Breadth beyond engineering is developed through the Complementary Studies Electives as well as the Engineering Economics requirement.

### **1.2. Knowledge of Methodologies**

Every POST has requirements which demonstrates a student's understanding of the methods of engineering design. Students in all engineering programs must successfully complete courses with substantial design in their first three years and a Capstone design course in their senior years. These courses require students to evaluate the appropriateness of various approaches to analyze and solve the design problem and also to devise and sustain arguments for their design. In most POSTs, students have the opportunity to participate in a research thesis course that familiarizes them with the specific methodologies currently in use in the development of knowledge in their discipline.

### **1.3. Application of Knowledge**

The application of science and mathematics to solve problems is fundamental to all programs in Engineering and therefore is required in many of the courses within all POST. A minimum level of instruction in Engineering Science and Engineering Design is required, both of which directly involve the application of knowledge.

### **1.4. Communication Skills**

The Faculty requires students to communicate information, arguments and analysis accurately and reliably, orally and in writing, to specialist and non-specialists audiences. The requirement for courses with substantial engineering design that are required across all programs require a series of technical reports and presentations with direct involvement with our Engineering Communication Program. In addition, our Capstone Design Courses and research theses all involve a written report and most involve oral presentations. The course requirements for instruction in Complementary Studies also adds to the education our students receive in communication skills. Also, the English Proficiency requirement insures a minimum level of writing ability for all graduates.

### **1.5. Awareness of Limits of Knowledge**

Each POST develops, through a sequence of courses starting at the 100-series or 200-series and culminating at the 300-series or 400-series or 500-series of courses, an understanding of a discipline as it is currently appreciated by educators who are at the same time involved in original scholarship in the subject area. The course content at the upper series level is designed, in part, to provide students with an appreciation of the uncertainties, ambiguities and limitations of knowledge in the specific area.

### **1.6. Autonomy and Professional Capacity**

The development of an awareness and understanding of professional practice is required for all POST. The required design courses require students to work in teams and also accept responsibility for their own contributions. Students are required to make their own decisions for their own learning through selection of their technical and nontechnical electives. Finally, in completing their course requirements, the Faculty expects strict adherence by students to

the Code of Behaviour on Academic Matters, which requires students to not tolerate or encourage the creation of an environment of cheating, misrepresentation or unfairness.

### **1.7. Other Degree Level Expectations**

The Faculty requires all students to have developed competency in several areas of learning and applying knowledge not identified explicitly in the previous sections. In particular, the Faculty requires students to have developed competencies in quantitative reasoning and in information literacy.

Quantitative reasoning is considered the ability to identify, assemble and interpret quantitative information and make and test hypotheses based on such data. Development of this competency is an explicit part of all POSTs offered by the Faculty.

The Faculty requires all students to develop an advanced understanding of how to obtain information, manipulate and evaluate it and bring diverse sources together to develop a comprehensive understanding of specific issues, solve problems or apply the scientific method to create further knowledge in the discipline. These advanced information literacy skills are developed through the studies in their concentration(s) and are demonstrated in the advanced courses required in each POST.

## Appendix B: Proposed Calendar Copy

### Course Requirements for the Certificate in Electric Vehicle Design

Electrifying the transportation sector is one of the major priorities to reach Net Zero emissions. The transition to electric vehicles (EVs) in the automotive sector is the largest technology shift in over 100 years. A new generation of skilled engineers is needed to address the cross-disciplinary challenges in the growing EV sector.

This certificate provides an opportunity for students to learn about EVs within the context of engineering applications and expand their understanding of the technical and environmental implications of engineering in EV design.

All undergraduate Engineering students are eligible to participate in this certificate program. Students who complete the requirements of the certificate will receive a notation on their transcript upon graduation.

The requirements for the certificate are the successful completion of the following courses:

Courses	Term	Lec	Lab	Tut	Wgt
<b>Mandatory Course:</b>					
APS380H1 - Introduction to Electric Vehicle Design	F	3	3a	0	0.5
<b>One of the following courses:</b>					
MIE535H1: Electrification Through Electricity Markets	S	3	1	1	0.5
MIE346H1: Analog and Digital Electronics for Mechatronics	S	3	1.5	1	0.5
MIE366H1: Electronics for Robotics	F	3	1.5	2	0.5
ECE314H1: Fundamentals of Electrical Energy Systems	F	3	1.5	1	0.5
ECE349H1: Introduction to Energy Systems	F	3	1.5	1	0.5
CHE469H1: Fuel Cells and Electro-chemical Conversion Devices	S	3	0	1	0.5
MSE458H1: Nanotech in Alternate Energy Systems	S	3	0	2	0.5

<b>One of the following courses:</b>	Term	Lec	Lab	Tut	Wgt
MIE363H1: Operations and Supply Chain Management	S	3	0	2	0.5
MIE304H1: Introduction to Quality Control	S	3	1	2	0.5
MIE404H1: Control Systems I					
MIE515H1: Alternative Energy Systems	F	3	0	1	0.5
MIE443H1: Mechatronics Systems: Design and Integration	S	2	5	0	0.5
MIE444H1: Mechatronics Principle	F	2	3	0	0.5
ROB521H1: Mobile Robotics and Perception	S	3	1.5	1	0.5
AER525H1: Robotics	F	3	1.5	2	0.5
MIE519H1: Advanced Manufacturing Technologies	S	3	0	0	0.5
MSE443H1: Composites Materials Engineering	F	3	0	0	0.5
ECE311H1: Introduction to Control Systems	F/S	3	1.5	1	0.5
ECE342H1: Computer Hardware	S	3	3	0	0.5
ECE463H1: Electric Drives	S	3	1.5	1	0.5
ECE520H1: Power Electronics	F	3	1.5	1	0.5
CHE507H1: Data-based Modelling for Prediction and Control	S	3	0	1	0.5
Relevant capstone or thesis project (H or Y)	F/S/Y				0.5/ 1.0

*Note: Availability of the courses for timetabling purposes is not guaranteed; the onus is on the student to ensure compatibility with their timetable.*



**UNIVERSITY OF TORONTO**  
**FACULTY OF APPLIED SCIENCE & ENGINEERING**

**Report No. 3761**

**MEMORANDUM**

**To:** Executive Committee of Faculty Council (February 5, 2024)  
 Faculty Council (February 27, 2024)

**From:** Professor Evan Bentz  
 Chair, Undergraduate Curriculum Committee

**Date:** January 22, 2024

**Re:** Major Curriculum Changes for the 2024-2025 Academic Year

**REPORT CLASSIFICATION**

This is a major policy matter that will be considered by the Executive Committee for endorsement and forwarding to Faculty Council for vote as a regular motion (requiring a simple majority of members present and voting to carry).

**BACKGROUND**

The Undergraduate Curriculum Committee is tasked with managing the curriculum change process for the Faculty.

**PROPOSED**

This report summarizes course changes proposed for the 2024-2025 academic year.

**CONSULTATION PROCESS**

These changes have been reviewed and approved by the Undergraduate Curriculum Committee, which is comprised of teaching staff representatives from the Faculty's departments and institutes; undergraduate student representatives; the Vice-Dean, Undergraduate; the Vice-Dean, First Year; the Director, First Year Curriculum; the Associate Dean, Cross-Disciplinary Programs; the Assistant Dean and Director, Diversity, Inclusion and Professionalism; and the Faculty Registrar. The Committee meets regularly to review and approve proposed changes to the undergraduate curriculum. The impact of these changes on students in the relevant programs has been considered.

**RECOMMENDATION FOR COUNCIL**

THAT the proposed curriculum changes for the 2024-2025 academic year, as described in Report 3761, be approved.

## PROPOSED CURRICULUM CHANGES

### 1. CHEMICAL ENGINEERING & APPLIED CHEMISTRY

#### 1.1. Update calendar description and AU distribution for **CHE304/305: Chemical Engineering and Applied Chemistry – Laboratory III & IV**

CURRENT calendar description: This laboratory course involves experiments investigating thermodynamics and kinetics, complementing two courses this term. Thermodynamic experiments include phase equilibrium and calorimetry, and kinetics experiments include investigations of rate constants and Arrhenius behaviour. Experimental applications of physical and chemical principles using pilot scale equipment. Experiments illustrating major unit operations: distillation; absorption; reactors; extraction; humidification; heat exchange.

CURRENT AU Distribution: 100% NS

PROPOSED calendar description: This is a laboratory course that provides a hands-on exploration of fundamental chemical engineering principles. Students apply and integrate core engineering concepts and principles, including fluid statics and dynamics, heat and mass transfer, thermodynamics and phase equilibria, chemical kinetics and reactions, and separations. The course also develops skills in trouble shooting, process scale-up design and optimization, data analysis, and process safety.

PROPOSED AU Distribution: 100% ES

- *New description is more concise and emphasizes important skill development.*
- *AU distribution was a clerical error that needs to be corrected.*

#### 1.2 Update AU distribution for **CHE204/205: Chemical Engineering and Applied Chemistry – Laboratory I & II**

CURRENT AU Distribution: 100% NS

PROPOSED AU Distribution: 60% NS, 20% ES, 20% CS

- *The ES content is picked up through the application of NS to practical problems and the development of experimental procedures. The CS content is attributed to the time spent in the course teaching students how to properly document information, communicate ideas to their peers and TAs, and write technical documents.*

#### 1.3 Update AU distribution for **CHE399: Professional Engineering Consultancy**

CURRENT AU Distribution: None

PROPOSED AU Distribution: 30% ED, 20% ES, 50% CS

- *Course was missing AU distribution.*

## **2. CROSS-DISCIPLINARY PROGRAMS**

### **2.1 Add new course: APS380H1 F – Introduction to Electric Vehicle Design**

3/3a/0/0.5

AECEREVD

PROPOSED calendar description: A multi-disciplinary introduction to key aspects of electric vehicle design, taught in modular form. Sub-system design perspective: electrical, mechanical, battery, powertrain and control; vehicle design; Manufacturing perspective: battery manufacturing, and life cycle; Industry 4.0 Automation perspective: vehicle-, manufacturing-, and city-level; Future directions: electrification, smart-grid, supply chains, and infrastructure.

PREVIOUSLY PRESENTED calendar description: A multi-disciplinary introduction to all aspects of Electric Vehicle Design, taught in modular form. Systems Design Perspective: Power, Mechanical, Battery, and Control Systems. Manufacturing Perspective: Battery design manufacturing, and life cycle; vehicle design; Industry 4.0 Automation Perspective: Vehicle-, Manufacturing-, and City-level. Future Directions: Electrification, Supply Chains, and Infrastructure.

- *Following further consultation and curriculum development, we are bringing forward the following new course in support of the proposed Certificate in Electric Vehicle Design.*



**UNIVERSITY OF TORONTO**  
**FACULTY OF APPLIED SCIENCE & ENGINEERING**

**Report No. 3760**

**MEMORANDUM**

**To:** Executive Committee of Faculty Council (February 5, 2024)  
Faculty Council (February 27, 2024)

**From:** Professor Evan Bentz  
Chair, Undergraduate Curriculum Committee

**Date:** January 18, 2024

**Re:** **Proposed Dates for the 2024-2025 Summer Session**

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**REPORT CLASSIFICATION**

This is a major policy matter that will be considered by the Executive Committee for endorsing and forwarding to Faculty Council for vote as a regular motion (requiring a simple majority of members present and voting to carry).

**SUMMARY**

In December 2023, members of Faculty Council voted to make all upcoming fall and winter terms 12.2 weeks long and for the dates associated with these terms to be set by Simcoe Hall so they can be consistent across the University. The two summer teaching terms are not standardized across the University and thus Engineering's summer terms will continue to be defined by Council.

The Undergraduate Curriculum Committee is responsible for determining session dates for the first and second summer terms through consultation with the Colleges and Residences, as well as with the University holiday schedule. These session dates have been reviewed and approved by the Undergraduate Curriculum Committee.

**PROCESS AND CONSULTATION**

The proposed dates for the 2024-2025 summer session have been reviewed and approved by the Undergraduate Curriculum Committee, which is comprised of teaching staff representatives from the Faculty's departments and institutes; undergraduate student representatives; the Vice-Dean, Undergraduate; the Vice-Dean, First Year; the Director, First Year Curriculum; the Associate Dean, Cross-Disciplinary Programs; the Assistant Dean and Director, Diversity, Inclusion and Professionalism; and the Faculty Registrar.

The Office of the Vice-Provost, Students compiles dates of religious observances which may require accommodation. The dates for the 2024-2025 year can be found at: <https://www.vicprovoststudents.utoronto.ca/policies-guidelines/accommodation-religious/>.

### Proposed APSC Session Dates for Summer 2024-2025

	Engineering T-Program	Engineering	Arts & Science (Estimate)
First day of lectures (F & Y session course)	May 6, 2024	May 6, 2024	May 6, 2024
Victoria Day	May 20	May 20	May 20
Last day of lectures for F session courses/(Y pause)	June 19	June 19	June 17
Makeup Class	-	-	-
F session course Study Break	June 20	June 20	June 18
Exam Period for F Session Course	June 21-27	June 21-27	June 19-24
UofT President's Day Closure	June 28	June 28	June 28
Deferred Exams	-	-	-
Canada Day	July 1	July 1	July 1
First day of lectures for S session course	July 2	July 2	July 2
Civic Holiday	August 5	August 5	August 5
Last day of lectures for S & Y session course	August 15	August 15	August 12
FAS Makeup Class	-	-	-
Study Break	August 16	August 16	August 14
Exam Period for S & Y session courses	August 19-23	August 19-23	August 15-23

### RECOMMENDATION FOR FACULTY COUNCIL

THAT the summer session dates for the 2024-2025 academic year be approved as described in Report 3760.



**UNIVERSITY OF TORONTO**  
**FACULTY OF APPLIED SCIENCE & ENGINEERING**

**Report No. 3762**

**MEMORANDUM**

**To:** Executive Committee of Faculty Council (February 5, 2024)  
 Faculty Council (February 27, 2024)

**From:** Professor Lisa Romkey  
 Chair, Engineering Graduate Education Committee (EGEC)

**Date:** January 22, 2024

**Re:** **Engineering Graduate Education Committee Update**

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**REPORT CLASSIFICATION**

This is a routine or minor policy matter that has been approved by the Engineering Graduate Education Committee (EGEC). It will be considered by the Executive Committee for approval and forwarding to Faculty Council for information.

**MINOR MODIFICATION**

<p><b>Collaborative Specialization in Psychology, Psychiatry and Engineering (PsychEng)</b></p>	<p>Addition of the Aerospace MAsc and PhD programs to the Collaborative Specialization in Psychology, Psychiatry and Engineering (PsychEng) (Appendix 1)</p> <ul style="list-style-type: none"> <li>• Addition of Peter Grant and Hugh Liu as core graduate faculty members to the collaborative specialization.</li> <li>• Addition of AER1601 (Aerospace Engineering and Operations Management) to the list of PsychEng elective courses in the collaborative specialization.</li> </ul>
<p><b>MEng Emphasis in Analytics</b></p>	<ul style="list-style-type: none"> <li>• Rename of Emphasis in Analytics to <b>Emphasis in Data Analytics and Machine Learning</b> (Appendix 2)</li> <li>• Addition of Elective Courses: BME1570 and MIE1520</li> <li>• Removal of Elective Courses: ECE1778 and ECE1510</li> </ul>

**NEW COURSES APPROVED**

<b>BME1452</b>	<b>Polymers for Biomedical Engineering:</b> Soft materials like polymers are powerful tools for biomedical engineering and have applications in drug delivery, regenerative medicine and biomedical devices. Polymer chemistry and structure can dictate material function and can be used to tune the way these materials interact with biological matter. This course introduces polymer material properties including rheology, gelation, solubility, and glassy phase transition in the context of designing materials for biomedical applications. Classes will alternate between lectures that focus on introducing these fundamental polymer concepts and discussion-based classes where we will explore the application of these concepts in innovative biomaterials in the literature.
<b>BME1088</b>	<b>Concepts in Immunoengineering:</b> Immunoengineering is an emergent field that has significantly impacted numerous areas in biomedical sciences. This course will provide brief overviews on fundamental immunological concepts that are recurrent in immunoengineering followed by more in depth coverage of vaccines, cancer immunotherapies, and advances in immunological understanding associated with these fields. The course material will draw from both textbook and scientific articles that will be delivered as lectures and group discussions.
<b>CIV1520</b>	<b>Travel Survey Methods:</b> This course provides the students with an understanding and knowledge of designing and implementing travel data collection studies. This course aims to provide comprehensive knowledge on all aspects of travel data collection necessary for the future professionals involved in planning, developing, operating, managing, and monitoring transportation systems. The course will equip the students with knowledge of basic concepts relevant to travel data collection and analysis, current practices in data collection, major steps involved in travel data collection for planning and management of transportation systems, and practical issues in travel data collection. <b>Note: Course Reinstatement</b>

**RECOMMENDATION FOR FACULTY COUNCIL**

For information.



## University of Toronto Minor Modification Proposal

### Participation in a Collaborative Specialization

This template was developed by the Office of the Vice-Provost, Academic Programs and updated in March 2019. It should be used to bring forward all proposals to add or withdraw participation of a degree program from a graduate collaborative specialization for governance approval under the [University of Toronto Quality Assurance Process](#).

<b>Collaborative specialization:</b>	Collaborative Specialization in Psychology, Psychiatry and Engineering (PsychEng)
<b>Collaborative specialization director:</b>	Prof. Li Shu
<b>Lead Faculty:</b>	Applied Science and Engineering
<b>Degree program(s) being added:</b>	MASc, PhD
<b>Unit offering above degree program:</b>	University of Toronto Institute of Aerospace Studies (UTIAS)
<b>Dean's Office contacts:</b>	Prof. Julie Audet, Vice-Dean, Graduate Studies Caroline Ziegler Faculty Governance and Programs Officer
<b>Version date:</b>	January 3, 2024
<b>Effective date:</b>	September 2024
<b>Approvals:</b>	PsychEng Committee – January 5, 2024 FASE Engineering Graduate Education Committee – January 11, 2024 FASE Council – February 27, 2024

### Core Graduate Faculty Research Synopses

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Core faculty members are those who are eligible to teach and/or supervise in the collaborative specialization, as appropriate. Core faculty members must hold graduate faculty membership in one of the participating degree programs. The process of identifying a graduate faculty member as a collaborative specialization core faculty

member is initiated by the faculty member or the collaborative specialization director. Both the faculty member's home unit chair/director and the collaborative specialization director must agree, as well as the faculty member involved. The collaborative specialization director is responsible for maintaining records of agreements concerning assignment of core faculty members to the collaborative specialization. Formal graduate faculty memberships in the collaborative specialization supporting units are not required for core faculty members.

There must be at least one core graduate faculty member from each participating program whose teaching and/or research expertise relate to that of the collaborative specialization subject area.

### **Peter Grant**

Publications: *(list two recent publications relevant to the focus of the collaborative specialization)*

- Teng, Tianhang & Grant, Peter. (2023). Human-in-the-loop Simulator Study of RPAS Teleoperation using Model Mediated Predictor Subjected to Atmospheric Turbulence and Time Delay. 10.2514/6.2023-2238.
- Grant, Peter & Moszczynski, Gregory & Schroeder, Jeffery. (2018). Post-stall Flight Model Fidelity Effects on Full Stall Recovery Training. 10.2514/6.2018-2937.

### **Hugh Liu**

Publications: *(list two recent publications relevant to the focus of the collaborative specialization)*

- C. Qin, Q. Yu, H. S. H. Go and H. H. -T. Liu, "Perception-Aware Image-Based Visual Servoing of Aggressive Quadrotor UAVs," in IEEE/ASME Transactions on Mechatronics, vol. 28, no. 4, pp. 2020-2028, Aug. 2023, doi: 10.1109/TMECH.2023.3276211.
- S Fan, HHT Liu (2013) Multi-UAV Cooperative Hunting in Cluttered Environments Considering Downwash Effects, Guidance, Navigation and Control, Vol. 03, No. 01, 2350004  
<https://doi.org/10.1142/S2737480723500048>

## Calendar Copy

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### **Append calendar copy for entire collaborative specialization (changes shown in red).**

For proposals adding new coursework-only participating programs, the calendar copy should clearly show that at least 30% of the courses taken towards the degree are in the area of specialization including the core course.

### **Psychology, Psychiatry and Engineering**

#### **Lead Faculty of the Collaborative Specialization**

Applied Science and Engineering

#### **Participating Degree Programs**

[Aerospace Studies](#) – MAsc, PhD

[Civil Engineering](#) — MAsc, PhD

[Electrical and Computer Engineering](#) — MAsc, PhD

[Mechanical and Industrial Engineering](#) — MAsc, PhD

[Medical Science](#) — MSc, PhD

[Psychology](#) — MA, PhD

#### **Supporting Units**

Department of Mechanical and Industrial Engineering

#### **Overview**

The Collaborative Master's and Doctoral Specialization in Psychology, Psychiatry and Engineering (PsychEng) includes participating programs offered by the Departments of Mechanical and Industrial Engineering, Civil and Mineral Engineering, Electrical and Computer Engineering **and the University of Toronto Institute of Aerospace Studies** in the Faculty of Applied Science and Engineering; the Department of Psychology in the Faculty of Arts and Science; and the Institute of Medical Science in the Temerty Faculty of Medicine.

Engineering involves the creative application of science to the design of systems, processes, structures, and technologies. Psychology is a science that focuses on the mind and behaviour of people and animals to understand individuals and groups across

all levels of analyses, from the cellular to the cultural. Psychiatry the study and treatment of mental illness, emotional disturbance, and abnormal behaviour.

The Psychology, Psychiatry and Engineering collaborative specialization supports graduate students and faculty interested in contributing to the growing interdisciplinary scholarship at the nexus of psychology, psychiatry, and engineering. Fields of study that may benefit from this collaborative specialization include, but are not limited to human factors, design theory and methodology, artificial intelligence and information engineering, mental health, operations research, and robotics. This specialization strengthens ties between the three Faculties and may propel research of interest to both beyond what is possible individually.

Upon successful completion of the master's and/or doctoral degree requirements of the participating home graduate unit and the collaborative specialization, students will receive the notation "Completed Collaborative Specialization in Psychology, Psychiatry and Engineering" on their transcript.

### **Contact and Address**

Collaborative Specialization in Psychology, Psychiatry and Engineering  
Department of Mechanical and Industrial Engineering  
University of Toronto  
5 King's College Road  
Toronto, Ontario M5S 3G8  
Canada

Web: [gradstudies.engineering.utoronto.ca/collaborative-specialization-psychology-engineering-psycheng](http://gradstudies.engineering.utoronto.ca/collaborative-specialization-psychology-engineering-psycheng)

Email: [psych\\_eng@mie.utoronto.ca](mailto:psych_eng@mie.utoronto.ca)

Telephone: (416) 946-3028

Fax: (416) 978-7753

### **Psychology, Psychiatry and Engineering: Master's Level**

#### **Admission Requirements**

- Applicants who wish to enrol in the collaborative specialization must apply to and be admitted to both the collaborative specialization and a graduate degree program in one of the collaborating graduate units.

- Applicants must provide:
  - A statement of purpose that describes background experience relating to psychology, psychiatry, and engineering, and motivation for pursuing studies in PsychEng. Complete the online [registration form](#).
  - A supervisor's letter of recommendation in support of the student's application to PsychEng.

### **Specialization Requirements**

- Two sessions of APS1305H PsychEng Seminar Series — Master's Level (Credit/No Credit) worth 0.0 full-course equivalent (FCE).
- Two PsychEng elective half courses (1.0 FCE). One of the courses must be from another discipline. Students from one discipline (psychology, psychiatry, or engineering) should first consult with the instructor before registering for a course in the other discipline to ensure adequate fit in terms of interest and preparation. Psychology and Medical Science students must complete at least one graduate course in Engineering, and Engineering students must complete at least one graduate course in either Psychology or Medical Science.
- A thesis focused on a topic in the area of the collaborative specialization.
- All students enrolled in the collaborative specialization must complete the requirements of the collaborative specialization, in addition to those requirements for the degree program in their home graduate unit. The collaborative specialization director and/or specialization committee is/are responsible for certifying the completion of the collaborative specialization requirements. The home graduate unit is solely responsible for the approval of the student's home degree requirements.

### **Psychology, Psychiatry and Engineering: Doctoral Level**

#### **Admission Requirements**

- Applicants who wish to enrol in the collaborative specialization must apply to and be admitted to a doctoral-level graduate degree program in one of the collaborating graduate units.
- Applicants must provide:
  - A statement of purpose that describes the applicant's background experience relating to psychology, psychiatry, and engineering, and motivation for pursuing studies in PsychEng. Complete the online [registration form](#).

- A supervisor's letter of recommendation in support of the student's application to PsychEng.

### **Specialization Requirements**

- Two sessions of APS1308Y *PsychEng Seminar Series — PhD Level* (Credit/No Credit) worth 0.0 full-course equivalent (FCE).
- Two PsychEng elective half courses (1.0 FCE). One of the courses must be from another discipline. Students from one discipline (psychology, psychiatry, or engineering) should first consult with the instructor before registering for a course in the other discipline to ensure adequate fit in terms of interest and preparation. Psychology and Medical Science students must complete at least one graduate course in Engineering, and Engineering students must complete at least one graduate course in either Psychology or Medical Science.
- A thesis focused on a topic in the area of the collaborative specialization.
- Students who have completed the PsychEng collaborative specialization at the master's level must take the core seminar course at the PhD level, which requires a higher level of participation, i.e., present more frequently and/or take a leadership role in seminar activities such as the discussion of research papers. Students take two further (different) PsychEng electives during their doctoral program, and their research will be at a level appropriate to a PhD degree.
- All students enrolled in the collaborative specialization must complete the requirements of the collaborative specialization, in addition to those requirements for the degree program in their home graduate unit. The collaborative specialization director and/or specialization committee is/are responsible for certifying the completion of the collaborative specialization requirements. The home graduate unit is solely responsible for the approval of the student's home degree requirements.

## Psychology, Psychiatry and Engineering Courses

### Core Courses

Course Code	Course Title
APS1305H	PsychEng Seminar Series — Master’s Level (Credit/No Credit)
APS1308Y <sup>0</sup>	PsychEng Seminar Series — Doctoral Level (Credit/No Credit)

### Elective Courses

- **Civil Engineering**

Course Code	Course Title
CIV1320H	Indoor Air Quality

- **Electrical and Computer Engineering**

Course Code	Course Title
ECE1774H	Sensory Cybernetics (suitable for Engineering students only)
ECE1778H	Creative Applications for Mobile Devices
JEB1444H	Neural Engineering (suitable for Engineering students only)

- **Mechanical and Industrial Engineering**

Course Code	Course Title
MIE1070H	Intelligent Robots for Society
MIE1402H	Experimental Methods in Human Factors Research
MIE1403H	Analytical Methods in Human Factors Research
MIE1412H	Human-Automation Interaction

MIE1415H	Analysis and Design of Cognitive Work
MIE1444H	Engineering for Psychologists and Psychiatrists
MIE1505H	Enterprise Modelling
MIE1510H	Formal Techniques in Ontology Engineering
MIE1720H	Creativity in Conceptual Design

- University of Toronto Institute of Aerospace Studies**

<b>Course Code</b>	<b>Course Title</b>
AER1601H	Aerospace Engineering and Operations Management

- Medical Science**

<b>Course Code</b>	<b>Course Title</b>
MSC1006H	Neuroanatomy
MSC1085H	Molecular Approaches to Mental Health and Addictions
MSC1087H	Neuroimaging Methods Using Magnetic Resonance Imaging
MSC1089H	The Biopsychosocial Basis of Mental Health and Addictive Disorders
MSC6000H	Special Topics Reading Course

- Psychology**

<b>Course Code</b>	<b>Course Title</b>
PSY1000H	Directed Studies
Department of Psychology courses offered in the 5000 series; contact the department for exclusions.	

<sup>0</sup> Course that may continue over a program. Credit is given when the course is completed.

**Appendix A: Addendum to the MOA**  
**To Add or Withdraw a Participating Degree Program**  
**in a Collaborative Specialization**

**ADDENDUM to MEMORANDUM of AGREEMENT**

**COLLABORATIVE MA, MASc, MSc, AND PhD SPECIALIZATION**  
**IN PSYCHOLOGY, PSYCHIATRY AND ENGINEERING**  
**Effective Date September 2024**

I indicate with my signature below that I have read the Memorandum of Agreement for the collaborative specialization. The graduate unit agrees to the participation of the degree program(s) named below. The graduate unit and participating graduate degree program agree to abide by the terms and conditions of the Memorandum of Agreement.

**Unit, Participating Graduate Degree Program**

UTIAS - University of Toronto Institute of Aerospace Studies  
MASc, PhD

**Collaborative Specialization Requirements and Degree Program Requirements**

*[Clarify how the collaborative specialization requirements are accommodated within the home degree program requirements. Following the format below, explain if the collaborative specialization requirements are in addition to the home program requirements or if they may be counted towards regular home degree program requirements, often with elective room. In addition, for coursework-only participating programs, show that at least 30% of the courses taken towards the degree must be in the area of specialization including the core course(s).]*

UTIAS MASc students are required to complete five courses (2.5 FCEs) including AER 1800H (Research Seminar in Aerospace Science and Engineering) as well as JDE 1000H (Ethics in Research), a one-day graduate seminar series (0.0 FCE). UTIAS PhD students are required to complete four technical courses and JDE 1000H.

Thus, UTIAS MASc and PhD students are required to complete 2.5 and 2.0 FCEs, respectively. Other than AER 1800H for MASc students, there are no required courses

across the department. Therefore, courses taken for the collaborative specialization may also count towards degree requirements.

All PsychEng graduate students are required to complete:

1. Two terms of a CR/NCR core seminar course worth 0.0 FCE:  
     APS1305 at the Master level, or  
     APS1308 at the PhD level.
2. One PsychEng-relevant graduate course (0.5 FCE) in the home discipline, and
3. One graduate-course in the "other" faculty.

That is, UTIAS graduate students will complete one (0.5 FCE) graduate course in Psychology (Faculty of Arts and Science) or Medical Science (Temerty Faculty of Medicine).

Psychology and Medical Science students must complete at least one (0.5 FCE) graduate course in the Faculty of Applied Science and Engineering.

A UTIAS course that non-engineers can complete is AER 1601H Aerospace Engineering and Operations Management.

## **University of Toronto Institute of Aerospace Studies**

### **MASc in Aerospace Studies**

#### **Participating Degree Program Requirements:**

# Required FCEs	=	<u>0.5</u>	(line 1)
# Elective FCEs	=	<u>2.0</u>	(line 2)
Total	=	<u>2.5</u>	(line 3)

**PhD in Aerospace Studies****Participating Degree Program Requirements:**

# Required FCEs = 0 (line 1)  
 # Elective FCEs = 2.0 (line 2)  
 Total = 2.0 (line 3)

**Collaborative Specialization Requirements:**

**For participating programs requiring a major research paper, essay, thesis or other major activity (e.g., practicum):**

*(leave blank if adding coursework-only participating program)*

The topic must be in the area of the collaborative specialization and under the supervision of a graduate faculty member associated with the collaborative specialization.

*Collaborative Specialization Requirements: # FCEs* = 1.0 (line 4)

*Line 4 (CS FCEs) must be equal to or less than line 2 (participating program elective courses)*

1.0 < or = 2.0  
 line 4 line 2

**For coursework-only participating programs:**

*(leave blank if adding participating program with a major research paper, essay, thesis or other major activity)*

At least 30% of the courses taken towards the degree must be in the area of specialization including the core course(s).

*Collaborative Specialization Requirements:*

*# Core course(s) FCEs* = \_\_\_\_\_ (line 5)

*# Additional course(s) FCEs* = \_\_\_\_\_ (line 6)

*Total* = \_\_\_\_\_ (line 7)

\_\_\_\_\_ X 30% = \_\_\_\_\_ (line 8)  
 line 3

*Line 7 (CS FCEs) must be equal to or greater than line 8 (30% of the courses taken towards the participating degree program)*

\_\_\_\_\_ > or = \_\_\_\_\_  
*line 7*                      *line 8*

*Line 7 (CS FCEs) must be equal to or less than line 2 (participating program elective courses)*

\_\_\_\_\_ > or = \_\_\_\_\_  
*line 4*                      *line 2*

**Resources to be provided by the participating unit/program:**

None are required.

# University of Toronto Minor Modification Proposal

## Participation in a Collaborative Specialization

### SIGNATURES – ADDENDUM to MEMORANDUM of AGREEMENT

**Graduate director of participating unit/program:**



Date: October 30, 2023

Prasanth B. Nair  
Professor and Associate Director, Graduate Studies  
Institute for Aerospace Studies

**Director of participating unit/program:**



Date:

January 8/2024

Chris Damaren  
Professor and Director  
Institute for Aerospace Studies

**Director of Collaborative Specialization:**



Date: October 30, 2023

Li Shu  
Professor of Mechanical and Industrial Engineering  
Director of Collaborative Specialization in Psychology, Psychiatry and Engineering

**Dean/Vice-Dean of lead Faculty:**



\_\_\_\_\_ Date: January 3, 2024

Julie Audet

Professor and Vice-Dean, Graduate Studies

Faculty of Applied Science & Engineering

# University of Toronto

## Minor Modification Proposal

### Change to an Existing Graduate Program or Collaborative Specialization

This template was developed by the Office of the Vice-Provost, Academic Programs and updated on March 6, 2018. It should be used to bring forward all proposals for minor modifications to program or admissions requirements for existing graduate programs or collaborative specializations under the [University of Toronto's Quality Assurance Process](#).

<b>Program/Collaborative Specialization being modified:</b>	Emphasis: Analytics (MEng only), open to students enrolled in the following graduate programs: <ul style="list-style-type: none"> <li>• Chemical Engineering &amp; Applied Chemistry, MEng</li> <li>• Civil Engineering, MEng</li> <li>• Electrical &amp; Computer Engineering, MEng</li> <li>• Materials Science &amp; Engineering, MEng</li> <li>• Mechanical &amp; Industrial Engineering, MEng</li> </ul>
<b>Graduate units:</b>	Above five
<b>Faculty:</b>	Applied Science & Engineering
<b>Dean's office contact:</b>	Julie Audet, Vice-Dean, Graduate Studies
<b>Version date:</b>	January 3, 2024

## 1 Summary

<input type="checkbox"/>	Changing admission requirements	X	Renaming field, concentration or emphasis*
X	Changing program requirements		Renaming of program or collaborative specialization (please notify VPAP before governance)
	Changing timing of program requirements		Creating a new emphasis
			Changes to programs affecting an MOA

\* Anything with a changed/new name requires consultation with VPAP Office prior to governance; if name change implies significant change to what is being offered or how it is being offered, this may be a major modification or new program.

This proposal covers two main changes to the emphasis:

- 1) Rename the Emphasis in Analytics to Emphasis in Data Analytics and Machine Learning.
- 2) Update the list of elective courses in the emphasis as new courses have been created and some courses are no longer offered since the last update in October 2021.

## 2 Effective Date of Change

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September 2024

## 3 Academic Rationale

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The goal of the emphasis name change is to make it easier for prospective graduate students to immediately see the relevance of this emphasis to data science and machine learning, as the term “Analytics” on its own was unclear to some as its interpretation can vary from one field to the other. Data Analytics involves the algorithmic processing of data for purposes of description (what happened), prediction (what will happen), or prescription (what should be done). Machine Learning focuses on the computational and statistical methods for learning patterns and associations and obtaining insights from data. Data Analytics and Machine Learning collectively represent the forefront of technology innovation powering a wide range of applications including personalized e-commerce, cybersecurity, intelligent logistics and scheduling, financial investing, digital marketing, adaptive user interfaces, and health applications including medical imaging analysis.

Consequently, the revised name also better reflects the topics covered in the core courses and the list of elective courses.

## 4 Impact on Students

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As indicated above, the name change will benefit current and prospective students as it will clarify the topics they will study in the emphasis. An updated list of electives will also make it possible to offer more choices and flexibility for students interested in completing the emphasis.

## 5 Consultation

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The change was discussed and proposed within MIE’s graduate curriculum committee (subcommittee AI/ML including current core course emphasis instructors) based on prospective and current student feedback.

## 6 Resources

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There are no resource implications.

## 7 Governance Approval

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<b>Unit sign-off</b>	Mechanical & Industrial Engineering Curriculum Committee (November 3, 2023)
<b>Dean's office sign-off</b>	Julie Audet, Vice-Dean, Graduate (January 3, 2024)
<b>Faculty/division council approval (or delegated body) if applicable</b>	Engineering Graduate Education Committee (EGEC) on behalf of the Council of the Faculty of Applied Science & Engineering (January 11, 2024)

## Appendix A: Calendar Entry (revisions in red)

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### Emphasis: **Data Analytics and Machine Learning** (MEng only)

To be admitted to the emphasis in **Data Analytics and Machine Learning**, MEng students must first successfully complete a **prerequisite course APS1070H (0.5 full-course equivalent [FCE])**.

Subsequently, to earn the emphasis, students must successfully complete **four additional half courses (2.0 FCEs)** from the list of core courses or elective courses. These must include at least one core course; the remaining courses must be selected from the list of elective courses.

Students must have completed the prerequisite course APS1070H before taking any of the core courses.

#### Prerequisite Course

APS1070H *Foundations of Data Analytics and Machine Learning*.

#### Core Courses

CHE1147H *Data Mining in Engineering*

ECE1513H *Introduction to Machine Learning* (exclusions: CSC311H1, CSC2515H, ECE421H1, ECE1504H)

MIE1624H *Introduction to Data Science and Analytics* (exclusion: MIE1626H)

MIE1626H *Data Science Methods and Statistical Learning* (exclusion: MIE1624H)

MSE1065H *Application of Artificial Intelligence in Materials Design* (exclusion: MSE1063H)

#### Elective Courses

APS502H1, APS1005H, APS1017H, APS1022H, APS1040H, APS1050H, APS1051H, APS1052H, APS1053H, APS1080H, **BME1570**  
CEM1002H

CHE507H1, CHE1108H, CHE1148H, CHE1434H

CIV1504H, CIV1506H, CIV1507H, CIV1532H, CIV1538H

ECE537H1, ECE1504H (exclusions: CSC311H1, CSC2515H, ECE421H1, ECE521H1, ECE1513H), ECE1505H, **ECE1510H**, ECE1657H, **ECE1778H**, ECE1779H, ECE1786H  
MIE562H1, MIE1077H, MIE1413H, MIE1501H, MIE1512H, MIE1513H, MIE1517H, **MIE1520H** (exclusion: **ECE1786H**), MIE1620H, MIE1621H, MIE1622H, MIE1623H, MIE1625H, MIE1628H, MIE1653H, MIE1666H, MIE1721H, MIE1723H, MIE1727H, MIE1769H, MSE1063H (exclusion: MSE1065H)

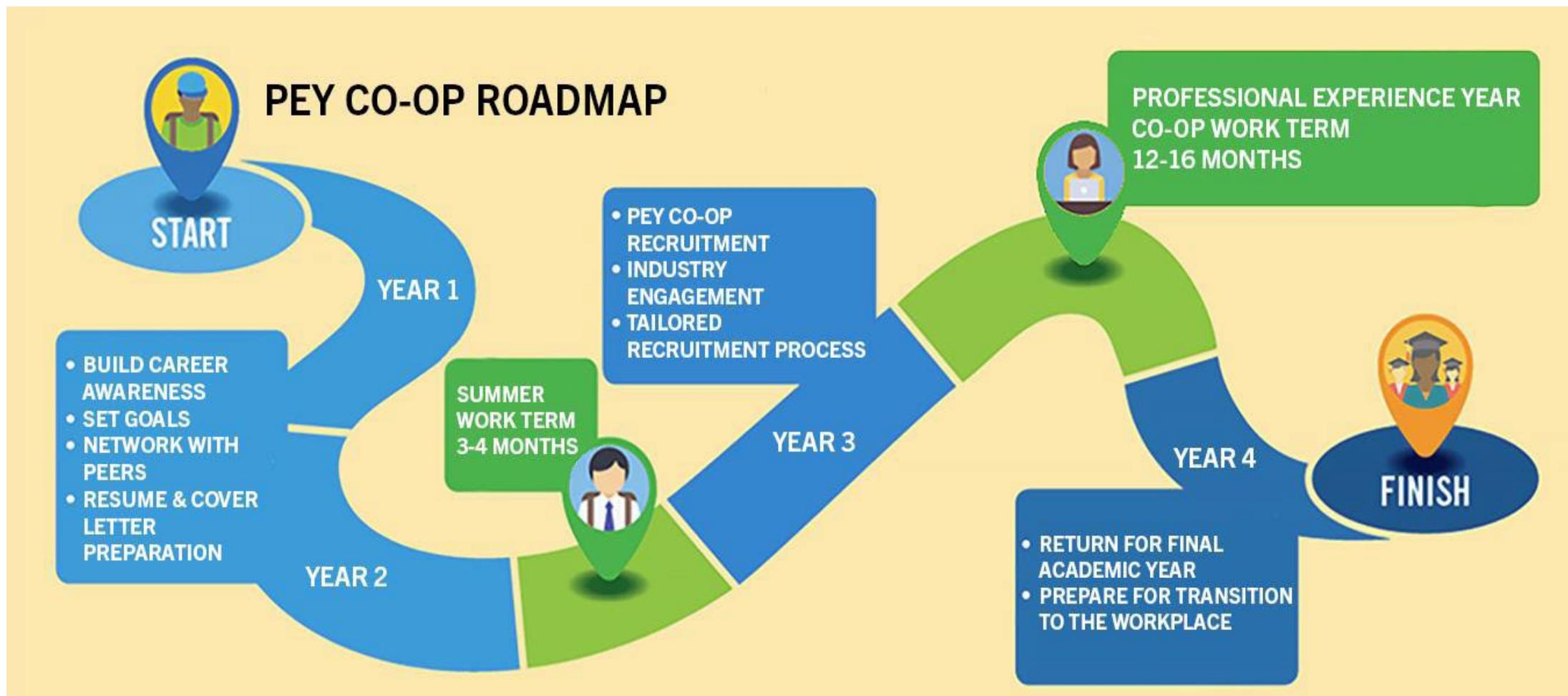
# Engineering Career Centre

Faculty Council Presentation

February 27, 2024

Tom Coyle – Vice Dean Undergraduate

Roger Francis – Executive Director



# PEY Co-op Student Enrollment

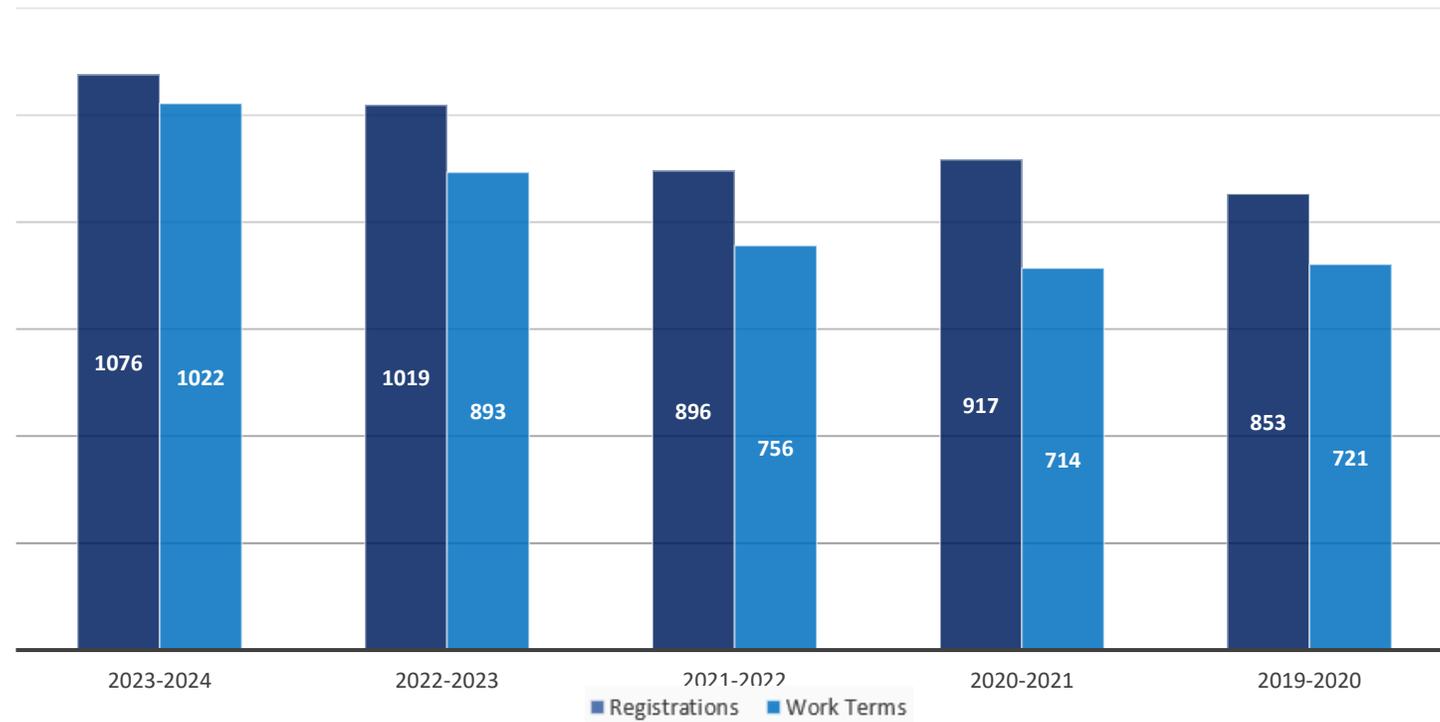
As of January 15, 2024

Campus	Year 1	Year 2	Year 3	PEY	Total
ENG	1411	1231	1114	1022	4778
UTM		287	217	68	572
Total	1411	1518	1331	1090	5350

## Student Development and Career Programming

- Preparatory Program
- Transition into workplace
- Peer Coach Mentorship

## PEY Co-op Registrations & Work Terms, 2019-2020 to 2023-2024 Engineering Students only



# PEY Co-op Registrations & Work Terms

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	<b>2023-2024</b>	2022-2023	2021-2022	2020-2021	2019-2020
<b>Registrations</b>	<b>1076</b>	1019	896	946	853
<b>Work terms</b>	<b>1022</b>	893	756	714	721

Note: Engineering students only

# Employer and job postings by discipline, 2023-24 WT's

<u>STUDENTS</u>				<u>JOB POSTINGS / POSTIONS</u>
Discipline	Registration	Work terms	Success	Postings – Per Discipline
Chemical	96	95	99.0%	631
Civil	81	77	95.1%	653
Computer	228	220	96.5%	2154
Electrical	105	100	95.2%	1894
Eng Science	237	217	91.6%	2142
Industrial	108	104	96.3%	730
Materials	45	41	91.1%	591
Mechanical	166	158	95.2%	978
Mineral	10	10	100.0%	349
<b>TOTAL</b>	<b>1076</b>	<b>1022</b>	<b>94.98%</b>	<b>3391*</b>

\* unique job postings

# 2024-25 WT Progress

12-16 Month Work Terms	
Chemical	53
Civil	37
Computer	127
Electrical	61
Engineering Science	1
Aerospace	12
Biomedical	10
Computer and Electrical	6
Energy Systems	6
Math, Stats & Finance	9
Physics	6
Robotics	24
Machine Learning	19
Industrial	44
Mineral	3
Materials	16
Mechanical	82
<b>TOTAL</b>	<b>516</b>

\* 1114 Engineering students in current recruitment cycle

# Current International WT

International Work Terms-Country	Work Terms	Engineering	Non-Engineering
China	15	14	1
England/Germany	1	1	0
United Kingdom	4	3	1
France	1	1	0
South Korea	2	2	0
Switzerland	2	2	0
Turkey	1	1	0
USA	45	45	0
<b>Total</b>	<b>71</b>	<b>69</b>	<b>2</b>

# Business Development Outreach

## Employer Outreach and Engagement

- **Ottawa Industry Tour (February 21-23, 2024)**
- **Calgary Business Development Outreach (February 5-9, 2024)**
- **Employer Information Sessions (26 sessions in current academic year)**
- **Airbus Event (May 29, 2023)**
- **Tesla Roadshow Event (January 30, 2024)**
- **Academic and Industry specific Co-op Coordinator support**
- **Industry specific panels (Biotech, Clean Energy, Aerospace, etc.)**

# Other Activities at the ECC

- **Advisory Committee**
  - Restructured committee to expand student representation
  - Increased meeting frequency from 2-3 / academic year
- **Engineering Society and other student collaborations**
  - Individual Academic department student prep and industry programming
- **FASE Graduate Programming**
- **Tri-campus Co-op Partnership**
  - Cross Division collaboration
- **Experiential Learning Commons**
  - Innovative space initiative, shared services and ability to amplify employer engagement
- **UTM**
  - Cross-division support

# Cupcake Mini-event at Myhal (February 13, 2024)

