UTQAP Self-study – Department of Civil & Mineral Engineering, 2022-23

As Commissioning Officer, I have reviewed and approved the self-study and confirm that it addresses:

- The terms of reference;
- The consistency of the program's learning outcomes with the institution's mission and divisional Degree Level Expectations, and how its graduates achieve those outcomes;
- Program-related data and measures of performance, including applicable provincial, national and professional standards (where available);
- The integrity of the data;
- The UTQAP program evaluation criteria (UTQAP section 5.6.5);
- Concerns and recommendations raised in previous reviews; Areas identified through the conduct of the self-study as requiring improvement;
- Areas that hold promise for enhancement;
- Academic services that directly contribute to the academic quality of each program under review.

I confirm that:

- The self-study describes in detail the participation of program faculty, staff and students in the self-study and how their views have been obtained and taken into account.

I have identified the reports and information to be provided to the Review Committee in advance of the site visit, and confirm that the following core items will be provided:

- Terms of reference;
- Self-study;
- Previous review report including the administrative response(s);
- Access to the curricula vitae of faculty;
- Any non-University commissioned reviews, (in this instance, the Canadian Engineering Accreditation Board review of the Civil & Mineral Engineering undergraduate programs, undertaken in 2019)
  Access to all course descriptions;
- The views of employers and professional associations solicited by the department of Civil & Mineral Engineering,
  particularly in relation to the internship component of the Master of Engineering Cities Engineering and Management program.

Commissioning Officer: **Signoff Date:**

Professor Christopher Yip
Dean, Faculty of Applied Science & Engineering

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CIVIL + MINERAL ENGINEERING

SELF-STUDY 2022

Civil & Mineral Engineering
UNIVERSITY OF TORONTO

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TABLE OF CONTENTS

Table of Contents

List of Tables 8
List of Figures 11
Appendices 14

Introduction and Context **16**

Positioning of U of T Engineering within Ontario and Canada 17
Positioning of the FASE within the University of Toronto 19
Positioning of FASE Relative to Undergraduate Applications and Yield 20
Positioning of the Department of Civil & Mineral Engineering within the Faculty of Applied Science & Engineering 23
- Undergraduate Programs 23
- Graduate Programs 27
- Faculty/Research 30

Overview of Self-study Process 34
Previous Review Recommendations 35

Academic Programs **36**

Overview 36
Undergraduate Programs 36
- Bachelor of Applied Science (BASc) 36
  - Civil Engineering Program 37
  - Lassonde Mineral Engineering Program 37
- Undergraduate Programs: Admissions and Program Structure
  - Admissions 38
    - *Characteristics of the First-Year Class 2022-23* *38*
    - *TrackOne (Undeclared)* *39*
    - *Undergraduate Enrollment Indicators* *40*
  - Undergraduate Programs - Structure 44
    - *Mutual Academic Activities* *45*
    - *Comparable Academic Activities* *45*
    - *Complementary Studies/Humanities and Social Sciences Electives* *46*

Opportunities for Student Research Experience 47
Opportunities for Student Learning Beyond the Program/Classroom 49
Minors/Certificate Programs 49
Professional Experience Year 50
Student Involvement in Professional Affiliations 51
Assessment of Learning 51
Undergraduate Degree Level Expectations/Graduate Attributes 52
Curriculum Review 53
Undergraduate Student Satisfaction 55
Retention Rates and Graduation 58
Degrees Awarded 58

Graduate Programs 62
Overview 62
Master of Engineering in Cities Engineering and Management (MEngCEM) 67
Master of Engineering in Civil Engineering (MEng) 68
Master of Applied Science in Civil Engineering (MASc) 69
Doctor of Philosophy in Civil Engineering (PhD) 70
Flexible-Time PhD Program *71*
Graduate Student Financial Support 72
External Fellowships *72*
Teaching Assistantships *74*
Graduate Programs Curriculum and Program Delivery 74
Assessment of Learning 75
Graduate Degree Level Expectations *75*
Student Satisfaction 78

Faculty **81**

Faculty Composition 81
Other Academic Appointments 83
Teaching Stream/CLTA/Part-time Faculty 83
Sessional Instructors 83
Workload 84
Faculty Administrative Service 84
Equity, Diversity and Inclusion 85
Faculty Mentorship, Promotion and Professional Development 85
Annual Reviews and Promotions 85
Faculty Awards and Recognitions 86

Research **88**

Preamble 88
Overview 88
Thematic Research Areas 89
Research Highlights 90
Building Engineering 90
Environmental Engineering 92
Mining and Geomechanics 96
Structural Engineering 98
Transportation Engineering and Planning 101
Research Facilities 104
Centers and Institutes 105
U of T Mobility Network 105

Centre for the Sustainable Built Environment 105
U of T Data Sciences Institute (DSI) 106
Research Funding 106
Research Impact and Assessment 110
Technology Transfer Indicators 112
Recognition of Leadership in Research 113
Large-scale Research Projects 116
Advanced and Emerging Issues in Drinking Water Treatment 116
Fundamentals and Implications of Hydraulic Fracturing Technology 117
Rankings 117
Media Impressions, Publications and Citations 129
Student Engagement in Research 130

Organization and Financial Structure 132

Governance Structure 132
Administrative Structure 133
Progress on 2017 Self-Study Review Recommendations with respect to Organization and Structure 134
Departmental Strategic Plan 134
Review of Staffing Structure 135
Technical Services/Information Technology 135
Student Services and External Relations 137
Administration and Finance 139
Summary of Review of Staffing Structure 140
Advisory Boards 141
Budget 141

Resources and Infrastructure 145

Departmental Research Facilities 147
Safety Management System 149
Facilities Projects Completed 2018-2022 149
Gull Lake Camp Facility 149
Projects In-progress 150
Future Space Planning 151

Internal and External Relationships 154

Internal Relationships 154
External Relationships 155

Future Directions 156

Undergraduate Education 156
Graduate Education – Research Stream (MASc and PhD) 157
Graduate Education – Professional Stream (MEng and MEngCEM) 157
Undergraduate and Graduate Student Experience 157
Departmental Research 158
Departmental Community 158

Glossary 159

APPENDICES

Appendix: A1 Comparison of U of T Engineering with Ontario and Canada, 2018-19 166

Appendix: A2 Comparison of U of T Engineering with Ontario and Canada 2019–2020 167

Appendix: A.3 Comparison of U of T Engineering with the University of Toronto, 2019–2020 168

Appendix: A.4 Comparison of U of T Engineering with the University of Toronto, 2020–2021 169

Appendix: A.5 Department of Civil & Mineral Engineering Self-Study 2022 Survey Results Undergraduate - Civil Engineering 170

Direct Student Commentary 173

Direct Student Commentary 190

Appendix: A.6 Department of Civil & Mineral Engineering Self-Study 2022 Survey Results Undergraduate- Mineral Engineering 193

Direct Student Commentary 204

Appendix: A.7 Department of Civil & Mineral Engineering Self-Study 2022 Survey Results Graduate - Doctoral-Stream Programs 206

Direct Student Commentary 216

Direct Student Commentary 217

Appendix: A.8 Department of Civil & Mineral Engineering Self-Study 2022 Survey Results Graduate - Professional Programs 234

Direct Student Commentary 240

Appendix: A.9 Department of Civil & Mineral Engineering Self-Study 2022 Survey Results - Administrative and Technical Staff 242

Appendix: A.10 2018-19 Final Assessment Report and Implementation Plan: Civil and Mineral Engineering 249

Appendix: B.1 Civil Engineering Program Curriculum, 2022-23 259

Appendix: B.2 Lassonde Mineral Engineering Program Curriculum, 2022-23 264

Appendix: B.3 Canadian Engineering Accreditation Board Graduate Attributes 267

Appendix: B.4 National Survey of Student Engagement (NSSE) Results for Department of Civil Engineering (2022 Survey) 268

Appendix: B.5 Program of Industry Participants in CivMin Career Fair, January 2023 272

Appendix: B.6 Summary of Discussion from Student Services Staff Retreat, 2018 280

Appendix: B.7 Civil & Mineral Engineering Funding Packages 2022-23 287

Appendix: B.8 School of Graduate Studies Academic Calendar - Civil Engineering 2022-23 290

Appendix: B.9 Degree Level Expectations for Graduates Receiving the Degree of Master of Engineering 308

Appendix: B.10 Degree Level Expectations for Graduates Receiving the Degree of Master of Applied Science 310

Appendix: B.11 Degree Level Expectations for Graduates Receiving the Doctor of Philosophy 312

Appendix: C.1 Courses Taught by Sessional Instructors, 2022-2023 314

Appendix: C.2 Workload Policy and Procedures for Faculty in Civil & Mineral Engineering 316

Appendix: C.3 Administrative Positions held by Civil & Mineral Engineering Faculty as of December, 2022 322

Appendix: C.4 Guidelines for Mentoring Junior Faculty 325

Appendix: C.5 FASE Best Practices for Assessing Teaching Effectiveness in PTR Decisions 327

Appendix: C.6 Awards and Distinctions Conferred on U of T Civil and Mineral Engineering Faculty, 2006 to Presents 329

Appendix: C.7 Awards and Distinctions Conferred on Emeritus and Retired Faculty, 2005 to Present 331

Appendix: D Department of Civil and Mineral Engineering - Faculty Research Areas 2022-23 (listed by Research Theme) 332

Appendix: E Department of Civil and Mineral Engineering Constitution 340

Appendix: F Policy on Management of Departmental Space 347

Provostial Supplemental Documentation 352

Graduate Education – Research Stream (MASc and PhD) 352
University of Toronto Student Services Statement (St. George Campus) 355

FASE Supplemental Documentation

Faculty of Applied Science & Engineering: By the Numbers 2022

Additional Resources

Department of Civil & Mineral Engineering Strategic Plan 2023-28
Civil & Mineral Engineering Self-Study 2017

List of Tables

Table 1.1 Comparison of U of T Engineering with Ontario and Canada 2020-2021 17

Table 1.2 Comparison of U of T Engineering with the University of Toronto, 2021-2022 19

Table 1.3 Department of Civil & Mineral Engineering Applications, Offers, Registrations, 2014 to 2021 24

Table 1.4 Graduate Enrolment by Full-Time Equivalent (FTE) and Headcount (HC) by Academic Area, 2012-2013 to 2021-2022 27

Table 1.5 Time to Completion for FASE PhD, MASc, MEng and MHSc Students, 2012–2013 to 2021–2022 29

Table 1.6 Time to Completion for Graduate Students - Department of Civil & Mineral Engineering, 2012-2013 to 2021-2022 29

Table 2.1 Characteristics of the First-Year Class, 2022-23 39

Table 2.2 Student Transfers from Track One, 2017 to 2022 40

Table 2.3 International Enrolment - Civil Engineering, 2018 to 2022 43

Table 2.4 International Enrolment - Lassonde Mineral Engineering, 2018 to 2022 43

Table 2.5 International Enrolment - Faculty of Applied Science & Engineering, 2018 to 2022 43

Table 2.6 Women Undergraduate Enrolment - Civil Engineering, 2018 to 2022 44

Table 2.7 Women Undergraduate Enrolment - Lassonde Mineral Engineering, 2018 to 2022 44

Table 2.8 Women Undergraduate Enrolment - Faculty of Applied Science & Engineering, 2018 to 2022 44

Table 2.9 Undergraduate Participation in Summer Research Opportunities by Academic Area, 2022 47

Table 2.10 NSERC Undergraduate Summer Research Awards - Civil & Mineral Engineering Student Participation, 2018 to 2023 48

Table 2.11 All Engineering Students Completing Minor and Certificate Programs, 2017-18 to 2021-22 49

Table 2.12 Civil & Mineral Engineering Students Completing Minor and Certificate Programs, 2017-18 to 2021-22 50

Table 2.13 Department of Civil & Mineral Engineering Graduate Student Funding, 2016-17 to 2021-22 74

Table 2.14 Student Satisfaction Benchmark – Doctoral Students 2010-2019 78

Table 2.15 Student Satisfaction Benchmark – Research Master's Students 2010-2019 79

Table 2.16 Student Satisfaction Benchmark – Professional Master's Students 2010-2019 80

Table 4.1 Total FASE Research Funding (Infrastructure and Operating) by Year and Source, 2011-12 to 2020-21 107

Table 4.2 Distribution of Industry Sponsored Research by Academic Area, 2011-12 to 2020-2021 107

Table 4.3	Research Operating Funding by Year, Source and Funding per Faculty Member, Faculty of Applied Science & Engineering, 2011-12 to 2020-21	108
Table 4.4	Comparison of Participation Rates for Tri-Agency Funding: Department of Civil & Mineral Engineering, Faculty of Applied Science & Engineering, Division III and all U of T, 2011 to 2019	110
Table 4.5	Active Award Count Pro-rated to Grant Year (April-March) – Department of Civil and Mineral Engineering, 2014 to 2021	111
Table 4.6	Active Award Count Pro-rated to Grant Year (April-March) – Faculty of Applied Science and Engineering, 2014 to 2021	111
Table 4.7	Success in Tri-Agency Grant Applications, Department of Civil and Mineral Engineering, Fall 2013-Fall 2020	111
Table 4.8	Technology Transfer Indicators, Department of Civil and Mineral Engineering FY2014 to FY2022	112
Table 4.9	Department of Civil and Mineral Engineering Faculty Research Designations as at December, 2022	113
Table 4.10	List of Awards Won by Faculty Members, Department of Civil and Mineral Engineering, 2014 to 2022	114
Table 4.11a	Academic Ranking of World Universities (ARWU) Canadian Universities in the Top 100 - Mining & Mineral Engineering, 2022	117
Table 4.11b	Academic Ranking of World Universities (ARWU) Canadian Universities in Top-100 - Civil Engineering, 2022	118
Table 4.12a	QS World University Rankings: Top 200 Canadian Universities for Engineering and Technology 2023	118
Table 4.12b	QS World University Rankings: Canadian U15 Universities - Mineral Engineering 2023	119
Table 4.12c	QS World University Rankings: Canadian U15 Universities in Top 200 Universities - Civil and Structural Engineering 2023	119
Table 4.12d	QS Worls University Rankings: Top 50 Univerisities for Mineral and Mining Engineering 2023	120
Table 4.12e	QS World University Rankings: Top 50 Universities for Engineering and Technology 2023	121
Table 4.12f	QS World University Rankings: World Top 50 Universities for Civil Engineering 2023	122
Table 4.13a	THE World University Rankings: Canadian Universities in Top 100 Universities - Civil Engineering, 2018-2023	
Table 4.13b	THE World University Rankings: Top World Universities - General Engineering, 2023	123
Table 4.13c	THE World University Rankings: Top World Universities - Civil Engineering, 2023	124
Table 4.14a	NTU World Rankings: Canadian Universities in Top 100 - Civil Engineering, 2022	124
Table 4.14b	NTU World Rankings: Canadian Universities in Top 100 - Geosciences, 2022	125
Table 4.14c	NTU World Rankings: Canadian Universities in Top 100 - Energy Sciences and Engineering, 2022	125
Table 4.14d	NTU World Rankings: Field of Engineering, University of Toronto, 2022	125

Table 4.15a US News Best Global Universities: Canadian Universites in Top 100 - Civil Engineering, 2022 126

Table 4.15b US News Best Global Universities: Canadian Univerisites in Top 100 - Geosciences, 2022 126

Table 4.16a Publication and Citation Rankings – Civil Engineering (Clarivate Analytics, 2022) 127

Table 4.16b Publication and Citation Rankings – Geological Engineering (Clarivate Analytics, 2022) 128

Table 5.1 Department of Civil Engineering 5-Year Comparison of Operating Budget FY2019-2023 143

Table 6.1 Department of Civil and Mineral Engineering - Space Cost per NASM FY15-16 to FY20-21 151

Table 6.2 Annual Occupancy Cost for Department Controlled Classrooms, FY2021 153

Table 7.1 Civil Engineering Industry and Lassonde Mineral Engineering Program Advisory Boards - Membership as at February, 2023 155

List of Figures

Figure 1.1 Applications, Offers, Registrations, Selectivity and Yield of First-Year U of T Engineering Undergraduates, 2012 to 2021 20

Figure 1.2 Applications, Offers, Registrations, Selectivity and Yield of Domestic U of T Engineering Undergraduates, 2012 to 2021 21

Figure 1.3 Applications, Offers, Registrations, Selectivity and Yield of International U of T Engineering Undergraduates, 2012 to 2021 21

Figure 1.4 Ontario Secondary School Averages of Incoming First-Year U of T Engineering Undergraduates, 2012 to 2021 22

Figure 1.5 U of T Engineering - Two-Year Retention Rate, 2010 to 2019 22

Figure 1.6 Applications, Offers, Registrations Civil Engineering, 2014 to 2021 23

Figure 1.7 Department of Civil & Mineral Engineering Enrolment by Program, 2014 to 2021 24

Figure 1.8 All U of T Engineering Undergraduates by Program, 2012-2013 to 2021-2022 25

Figure 1.9 Entering Averages of Ontario Secondary School Students - Department of Civil & Mineral Engineering, 2014 to 2021 25

Figure 1.10 Final-Year Achievment of Undergraduate Students - Department of Civil & Mineral Engineering, 2014 to 2021 26

Figure 1.11 U of T Engineering Undergraduate Student-to-Faculty Ratios by Academic Area, 2021–2022 26

Figure 1.12 Full-Time Equivalent Graduate Student-to-Faculty Ratios by Academic Area and Degree Type, 2021-2022 28

Figure 1.13 Graduate Student Funding by Category and Academic Area, 2020-2021 28

Figure 1.14 Total Research Funding (Infrastructure + Operating), 2011-2012 to 2020-2021 30

Figure 1.15 Research Operating Funding by Year, Source and Funding per FASE Faculty Member, 2011-2012 to 2020-2021 31

Figure 1.16 Research Operating Funding by Year, Source and Funding per Faculty Member - Department of Civil & Mineral Engineering, 2011-2012 to 2020-2021 32

Figure 1.17 Description of Research Operating Funding by Academic Area, 2011-2012 to 2020-2021 33

Figure 2.1 Faculty of Applied Science & Engineering Total Enrollment, 2014 to 2021 40

Figure 2.2 Civil and Mineral Engineering Undergraduate Enrollment, 2014 to 2021 41

Figure 2.3 Department of Civil & Mineral Engineering, Enrollment by Program, 2014 to 2021 41

Figure 2.4 Teck Resources Limited: Talent Pool Survey, 2012 to 2022 42

Figure 2.5 Teck Resources Limited: Talent Pool Survey – New Graduates, 2012 to 2021 42

Figure 2.6 Number of Engineering Undergraduate Students Participating in PEY Co-op with Percentage Participation, 2021-2023 to 2021-2022 51

Figure 2.7 Undergraduate Course Evaluation Summary, Winter term 2020 55

Figure 2.8 Undergraduate Course Evaluation Summary, Fall term 2020 55

Figure 2.9 Undergraduate Course Evaluation Summary, Winter term 2021 56

Figure 2.10 Undergraduate Course Evaluation Summary, Fall term 2021 56

Figure 2.11 Undergraduate Course Evaluation Summary, Winter term 2022 57

Figure 2.12 Undergraduate Degree Awarded by Program, 2012-2013 to 2021-2022 59

Figure 2.13 U of T Engineering Degrees Awarded by Academic Area Compared with Canadian and North American Degree Total, 2020 59

Figure 2.14 Number of Students on the Dean's Honour List by Term and Academic Area, Fall 2017 to Winter 2022 60

Figure 2.15 Civil and Mineral Engineering Students on the Dean's Honour List by Year of Study, 2017-18 to 2021-22 61

Figure 2.16 Department of Civil & Mineral Engineering by Program, Faculty of Applied Science & Engineering – Average Grades (in %) at Graduation 61

Figure 2.17 Applications, Offers, Registrations - MEngCEM, 2013-14 to 2020-21 63

Figure 2.18 Applications, Offers, Registrations - MEng, 2013-14 to 2020-21 63

Figure 2.19 Applications, Offers, Registrations – MASc, 2013-14 to 2020-21 64

Figure 2.20 Applications, Offers, Registrations – PhD, 2013-14 to 2020-21 64

Figure 2.21 Acceptance Rates – Professional Master's Degrees, 2013-14 to 2020-21 65

Figure 2.24 Time-to-Completion Master of Engineering (Full-time) 2014-2021 69

Figure 2.25 Time-to-Completion – Master of Applied Science 2014-2021 70

Figure 2.26 Time-to-Completion Full-time Doctoral Degrees 2013-14 to 2020-21 71

Figure 2.27 Percentage of MASc Students with External Fellowships/Scholarships 2013-14 to 2020-21 73

Figure 2.28 Percentage of Doctoral Students with External Fellowship/Scholarships 2013-14 to 2020-21 73

Figure 3.1 Department of Civil & Mineral Engineering, Appointed Faculty by Rank and Research Area, as at December 2022 81

Figure 3.2 Total Number of Faculty by Academic Area 2012-13 to 2021-22 83

Figure 3.3 Department of Civil and Mineral Engineering: List of Awards Not Exclusive to the Fields of Civil or Mineral Engineering Won by Faculty in the Department, 2014 to 2021 86

Figure 3.4 Department of Civil and Mineral Engineering: List of Awards & Honours Exclusive to the Fields of Civil or Mineral Engineering Won by Faculty in the Department, 2014 to 2021 87

Figure 4.1 Department of Civil and Mineral Engineering – Distribution of Departmental Research Space by Research Theme, as at December, 2022 104

Figure 4.2 Total FASE Research Funding (Infrastructure and Operating), 2011-12 to 2020-21 106

Figure 4.3 Distribution of Research Operating Funding by Academic Area, 2011-12 to 2020-21 108

Figure 4.4 Research Operating Funding by Year, Source and Funding per Faculty Member – Department of Civil and Mineral Engineering, 2011-12 to 2020-21 109

Figure 4.5 Proportion of U of T Engineering Media Impressions by Academic Area, 2021-2022 129

Figure 4.6 Proportion of U of T Engineering Media Impressions of Strategic Priority Area, 2021-2022 130

Figure 4.7 Undergraduate Studies Research Award (USRA) Program – Department of Civil and Mineral Engineering Student Participation 2018 to 2023 131

Figure 5.1 Governance Structure of the Department of Civil & Mineral Engineering 132

Figure 5.2 Organizational Structure of the Department of Civil & Mineral Engineering 133

Figure 6.1 Summary of Buildings Occupied by Engineering, 2021-2022 145

Figure 6.2 Allocation of Departmental Space by Category 148

Figure 6.3 Department of Civil and Mineral Engineering - Occupancy Costs FY15-16 to FY20-21 152

1. INTRODUCTION AND CONTEXT

The Faculty of Applied Science and Engineering at the University of Toronto is consistently ranked among the top engineering schools in the world and the Department of Civil & Mineral Engineering has served as a foundational and leading component of the Faculty for over 135 years.

Founded in 1873 as the Ontario School of Practical Science, the initial institution was dedicated to the training of professional engineers in mining, civil engineering, mechanics and manufacturing. The Department has undergone several stages of growth and restructuring since those early years and currently offers a dynamic compendium of research and academic programs. Our mandate now spans a wide range of modern-day applications in professional practice encompassing the built environment and its infrastructure, transportation engineering and planning, structural engineering, environmental engineering, mining, and geomechanics. Throughout, our collective efforts have striven to provide leadership and innovation, exploring and examining new directions in practice such as sustainability, complex systems and transformative technologies.

The Department generally defines its' mission through the following statement:

We inspire students to become global leaders and innovators towards the design of infrastructure systems that lead to a healthy, equitable, prosperous and sustainable future.

We endeavor to hold up to this vision through the teaching in our two undergraduate programs, Civil Engineering and Lassonde Mineral Engineering, our professional studies Master of Engineering and Master of Engineering in Cities Engineering & Management graduate programs, and our influential and long-standing research-based Master of Applied Science and Doctor of Philosophy graduate programs. Detailed information about our department, programs and research will be addressed in the respective chapters of this report, and can also be found on our departmental website at [Department of Civil & Mineral Engineering (utoronto.ca)]

Our strengths are rooted within our long history of service to the University and the community-at-large, the quality of our teaching, the broad scope of our research, the dedication of our faculty and staff, the diversity of our student composition, and the support of our alumni. Our location within the downtown core of one of Canada's largest urban centres gives our students access to numerous opportunities for hands-on study, practice and mentorship, and provides our faculty with a wealth of possibilities for collaboration and research.

Our challenges are presented through the limitations inherent in on-going growth within the context of a confined space allocation and aging infrastructure, the increased competition for research and keeping pace with the exigent adaptations required to respond to today's unstable environmental conditions and rapidly changing societal patterns.

In determining the positioning of the Department of Civil & Mineral Engineering (CivMin) against comparable factors, it would be prudent to first generally assess the positioning of the Faculty of Applied Science & Engineering (FASE) against national averages, the FASE within the University of Toronto (U of T), and then to drill this down to demonstrate the positioning of the CivMin department within the FASE.

The Faculty's 2022 annual report "By the Numbers" provides a wealth of qualitative data which demonstrates FASE's performance in all aspects of activity over several academic cycles. A copy of this report is provided as supplemental documentation to this Self-study. Herein we highlight a few of the key metrics from that report as a means to establishing a basis for comparison of the Department's alignment in these same areas. In particular, we draw attention to the following data.

1.1 Positioning of U of T Engineering within Ontario and Canada

Comparative tables published in the FASE's 2021-22 annual report tabulate U of T Engineering against Canada-wide national averages. For example, Table 1.1 below shows that current FTE counts for undergraduate enrollment in the FASE was 5,526, a modest increase over FTE enrollments tabulated in the Faculty's previous report (a count of 5,273 in 2018-19)1, and resting at 5,257 in 2020-21. Although the percentage share of U of T Engineering's enrollment numbers relative to the national count has actually moved down slightly, from 6.0% in 2019-20 to 5.8% in 2020-21, FASE's percentage share of enrollments of undergraduate women students continues to lead the national average with 38.4% of our total undergraduate student population comprised of women. This is up by 3.6% from the national average of 21.9% tabulated in 2018-19, and increasing to 23.4% in 2019-2020.[1]

Table 1.1 Comparison of U of T Engineering with Ontario and Canada 2020-2021

	U of T Engineering	Ontario	U of T % of Ontario	Canada	U of T % of Canada
Undergraduate					
Enrolment (FTE)	5,526	41,046	13.5%	95,274	5.8%
% Women	38.4%	29.4%		25.2%	
Degrees Awarded	1,075	8,476	12.7%	18,476	5.8%
% Women	31.8%	27.0%		22.9%	
Master's (MEng, MASc and MHSc)					
Enrolment (FTE)	1,357	7,786	17.4%	18,756	7.2%
Degrees Awarded	793	4,735	16.7%	9,529	8.3%
% Women	30.8%	23.9%		25.5%	
Doctoral (PhD)					
Enrolment (FTE)	1,016	3,901	26.0%	10,704	9.5%
Degrees Awarded	118	613	19.2%	1,578	7.5%
% Women	22.0%	22.7%		22.4%	
Faculty					
Tenured and Tenure-Stream	243	1,749	13.9%	3,941	6.2%
% Women	19.1%	16.4%		16.6%	
Major Awards					
Major Awards Received	8	24	33.3%	63	12.7%
Research Funding					
NSERC Funding for Engineering	$37.M	$168.7M	21.9%	$421.1M	8.8%

Note: Because of the lag in reporting from some peer institutions, 2020–2021 is the most recent year for which all comparison data is available. Enrolment and degrees awarded are based on the 2020 calendar year. Faculty data is current as of November 2020. NSERC research funding is based on the 2020–2021 grant year (April-March). Major award counts are based on the 2021 calendar year.

1 Comparative tables for 2018-19 and 2019-20 are found in Appendices A.1 and A.2

In this same table, we see similar increases in the total number of MEng, MASc and MHSc FTE enrollments, going up from 1,296 in 2018-19 to 1,357 in 2020-21. As with enrollments of undergraduate women students, we also see a modest 0.3% increase in the percentage of women enrollments in these graduate programs.

Enrollments in our doctoral programs have increased as well, growing from 849 FTE in 2018-19 to 1,016 in 2020-21. However, we also see a noticeable downward trend in the number of doctoral degrees awarded, as well as the percentage of degrees awarded to women doctoral students over these same time periods, with the number of degrees awarded going down from a percentage share of 9.7% in 2019-20 to 7.5% in 2020-21, and the percentage of doctoral degrees conferred to women doctoral students going down from 25.7% in 2019-20 to 22.4% in 2021-22. These minor shifts may, in part, be attributable to disruptions associated with COVID-19, but as these are still relatively minimal shifts we do not see this movement as an indicator of decline in interest for research-based programs at this point in time.

Similarly, although the number of appointed faculty within the FASE went up slightly (by six additional FTE since 2018-19), our percentage share at the national level has remained fairly static. The total number of recognition awards received has dipped down slightly, moving from 16.4% of the national share in 2018-19 to 12.7% in 2020-21. And, while the total amount of funding secured across the FASE through various NSERC granting programs has gone up by $1.6M, this too represents a slight decline in the Faculty's percentage share at the national level (9.4% in 2018-19 compared to 8.8% in 2021-22.) This could also be reflective of shifts in government priorities related to COVID-19 over the past few years, as well as a natural expansion of the number of competing institutions across the post-secondary landscape in Canada.

1.2 Positioning of the FASE within the University of Toronto

The following highlights a comparison of the Faculty of Applied Science and Engineering against the University of Toronto over the period 2019-2020 through to 2021-22.

Table 1.2 Comparison of U of T Engineering with the University of Toronto, 2021-2022

	U of T Engineering	St. George Campus	Engineering % of Campus	University of Toronto	Engineering % of U of T
Student Enrolment					
Undergraduate	5,628	40,442	13.9%	70,416	8.0%
Professional Master's (MEng and MHSc)	1,181	9,596	12.3%	10,288	11.5%
Research Master's (MASc)	620	2,896	21.4%	3,010	20.6%
Doctoral (PhD)	1,210	7,374	16.4%	7,819	15.5%
All Students	8,639	60,308	14.3%	91,533	9.4%
Degrees Awarded					
Undergraduate	945	8,305	11.4%	14,052	6.7%
Professional Master's (MEng and MHSc)	627	4,573	13.7%	5,014	12.5%
Research Master's (MASc)	241	1,319	18.3%	1,362	17.7%
Doctoral (PhD)	129	876	14.7%	945	13.7%
Total Degrees	1,942	15,073	12.9%	21,373	9.1%
Faculty and Staff					
Professoriate	277			3,288	8.4%
Administrative and Technical Staff	408			10,881	3.8%
Research Funding					
Sponsored Research Funding	$98.3M			$617.9M	15.9%
Industry Research Funding	$19.7M			$41.8M	47.2%
Space					
Space (NASMs)	71,914	642,743	11.2%	859,886	8.4%
Revenue					
University-wide Costs	$86.1M			$672.7M	12.8%
Total Operating Revenue	$218.6M			$2,305.9M	9.5%

Note: Student enrolment is shown as of November 1, 2021. Degrees awarded are based on the 2021–2022 academic year (convocations in November 2021, March 2022 and June 2022). Professoriate includes comparison of U of T Engineering with University of Toronto, tenured, tenure-stream and teaching-stream faculty members. Administrative and technical staff includes full- and part-time staff. Faculty and staff data is as of September 2020, based on U of T Facts and Figures (2021). Research funding is based on the 2020–2021 grant year (April to March). Space is measured in Net Assignable Square Metres (NASMs). Revenue is based on the 2021–2022 U of T fiscal year (May to April).

In the above table we see that current enrollment numbers for all U of T Engineering programs have held to within a percentage point over previous years and that our institutional share remains on par with 2020-21 statistics[2]. While a more significant growth in enrollments is encouraged by the upper echelons of the University, we view the potential for growth as being constrained by the lack of physical space available on campus in which to grow Engineering enrollments. In 2021-22 the Faculty received a modest increase of only 0.1%, or 1,276 NASMs (Net Assignable Square Meters), over its assigned space in 2019-20.

The key statement presented by this metric is that it demonstrates that the FASE has maintained a strength in its ability to hold enrollment numbers at full capacity levels over a sustained period of time.

Although the total number of faculty members appointed within FASE went up by five FTE between 2020-21 and 2021-22, this still represents only 8.4% of total FTE faculty across the University. However, the faculty- to-student ratio within the Faculty has remained a fairly steady state, averaging at 17.0 over the past three years.

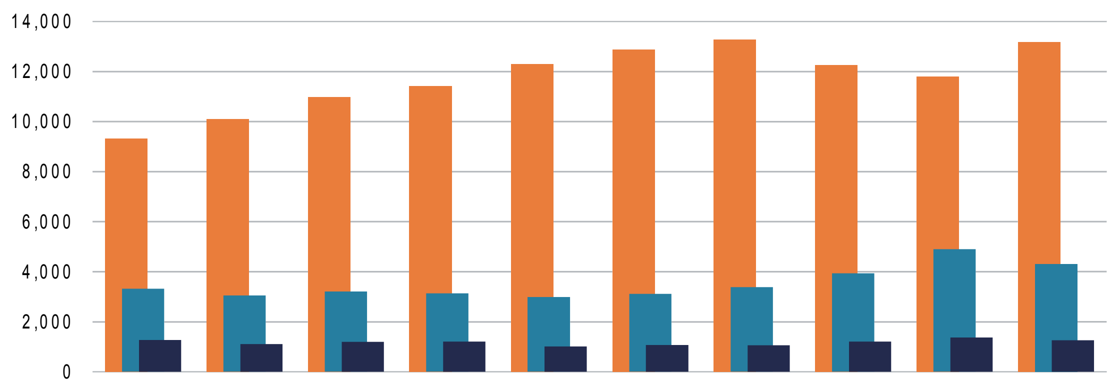
With regard to research funding, we note that sponsored research within the FASE in 2021-22 is down by approximately 4% over the total achieved in 2019-20, with the total amount of research funding generated through industry sources going down by a total of 9.2% over the same period. Again, it remains to be seen how much of this might be attributed to COVID-19 business disruptions.

In terms of revenue share, the total amount of University-wide costs apportioned to FASE went up by $10M for a total of $86.1M in 2021-22, while the total amount of operating revenue allocated to FASE has only grown by $3M over its 2019-2020 funding levels.

1.3 Positioning of FASE Relative to Undergraduate Applications and Yield

The following tables represent FASE's standing with respect to registration yields for domestic and international undergraduate students, the quality of applicants, and our collective undergraduate retention rates.

Figure 1.1 Applications, Offers, Registrations, Selectivity and Yield of First-Year U of T Engineering Undergraduates, 2012 to 2021



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Applications	9,326	10,095	10,989	11,418	12,298	12,880	13,272	12,263	11,807	13,188
Offers	3,309	3,042	3,203	3,126	2,983	3,109	3,380	3,937	4,898	4,298
Registrations	1,265	1,106	1,192	1,205	1,005	1,065	1,062	1,202	1,359	1,259
Selectivity	0.35	0.30	0.29	0.27	0.24	0.24	0.25	0.32	0.41	0.33
Yield	0.38	0.36	0.37	0.39	0.34	0.34	0.31	0.31	0.28	0.29

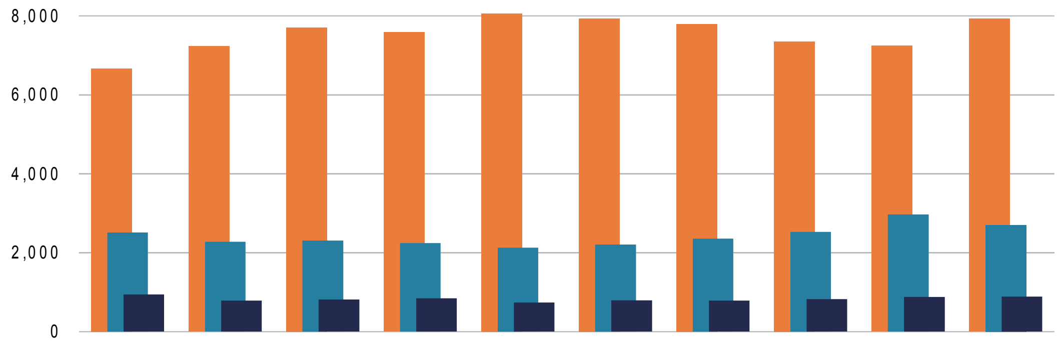
In Figure 1.1 above, we see that the overall yield of First-Year undergraduate students is 29% which is down slightly

2 Comparative tables for 2019-2020 and 2020-21 are found in Appendices A.3 and A.4

when compared to the Faculty's 10-year average, although the actual number of first year registrations has remained fairly static over this same timeframe. This data compilation also shows that although a significantly greater number of offers have been made each year, particularly over the past five academic cycles, the number of Faculty-wide registrations resulting from this corresponds to the number of registrations achieved in 2012 (1,265 in 2012/1,259 in 2021).

In Figures 1.2 and 1.3 below we see that the Faculty's domestic undergraduate yield tabulated in 2021 reflects a modest increase of 0.04% over the previous year (Fig. 1.2), but the international undergraduate yield is down by 17% over this same 10-year period (Fig. 1.3). Again, some of this minor decrease could be attributable to constraints associated with COVID-19 travel protocols and immigration backlogs.

Figure 1.2 Applications, Offers, Registrations, Selectivity and Yield of Domestic U of T Engineering Undergraduates, 2012 to 2021

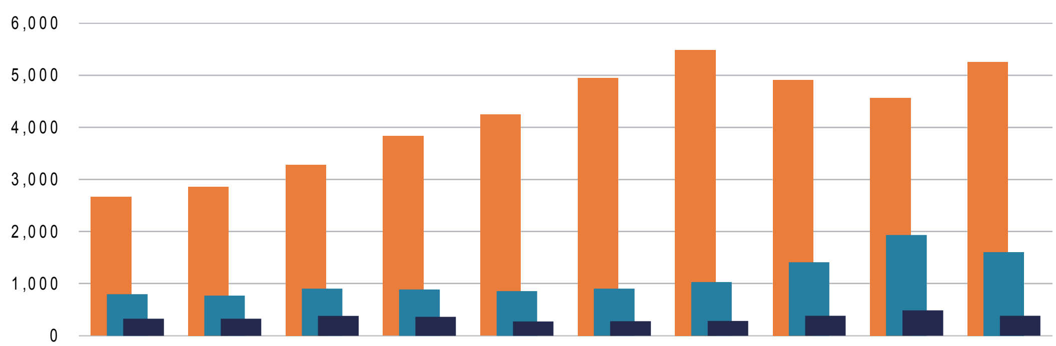


	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Applications	6,662	7,229	7,705	7,588	8,053	7,933	7,791	7,351	7,243	7,927
Offers	2,510	2,272	2,302	2,239	2,128	2,206	2,350	2,526	2,965	2,697
Registrations	938	782	812	843	734	788	780	821	874	880
Selectivity	0.38	0.31	0.30	0.30	0.26	0.28	0.30	0.34	0.41	0.34
Yield	0.37	0.34	0.35	0.38	0.34	0.36	0.33	0.33	0.29	0.33

Note 1: Entrance average is derived from data provided by the Ontario Universities' Application Center, and therefore only reflects Ontario secondary school students.

Note 2: Two-year retention rate is the proportion of students who successfully move on to second year within two years of beginning their studies. The years in this figure are those in which the relevant cohort began their studies.

Figure 1.3 Applications, Offers, Registrations, Selectivity and Yield of International U of T Engineering Undergraduates, 2012 to 2021



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Applications	2,664	2,866	3,284	3,830	4,245	4,947	5,481	4,912	4,564	5,261
Offers	799	770	901	887	855	903	1,030	1,411	1,933	1,601
Registrations	327	324	380	362	271	277	282	381	485	379
Selectivity	0.30	0.27	0.27	0.23	0.20	0.18	0.19	0.29	0.42	0.30
Yield	0.41	0.42	0.42	0.41	0.32	0.31	0.27	0.27	0.25	0.24

Figure 1.4 tabulates the incoming averages of Ontario Secondary Students which is up by 4.6% from 2012, now resting at 95.9%.

Figure 1.4 Ontario Secondary School Averages of Incoming First-Year U of T Engineering Undergraduates, 2012 to 2021

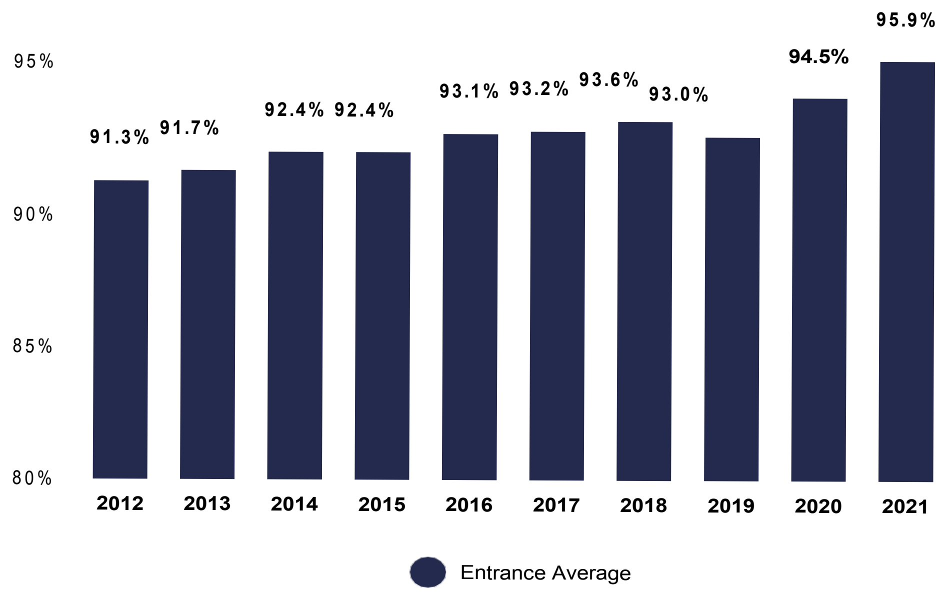
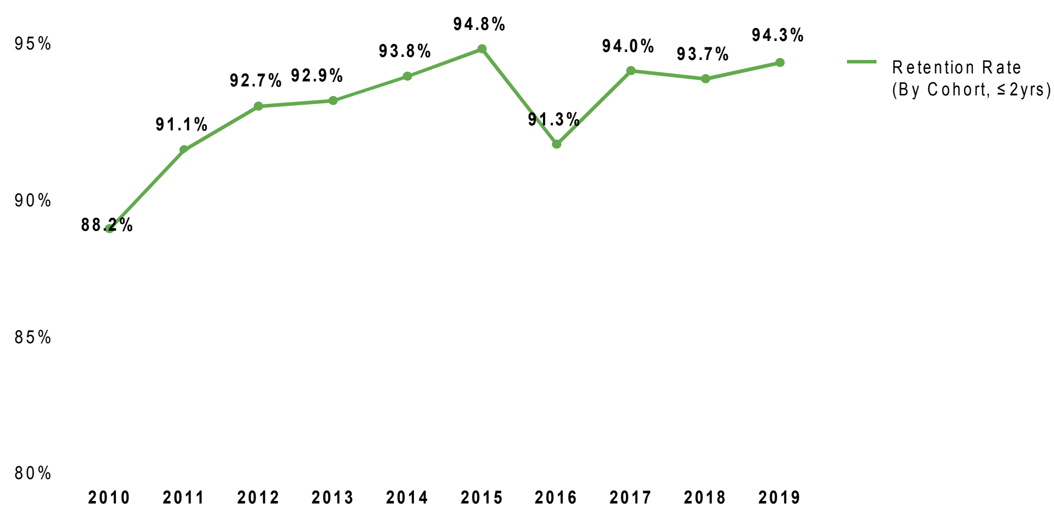


Figure 1.5 below depicts FASE's two-year retention rate. This has improved overall, up from 88.2% in 2010 to 94.3% in 2019, a 6.1% increase.

Figure 1.5 U of T Engineering - Two-Year Retention Rate, 2010 to 2019



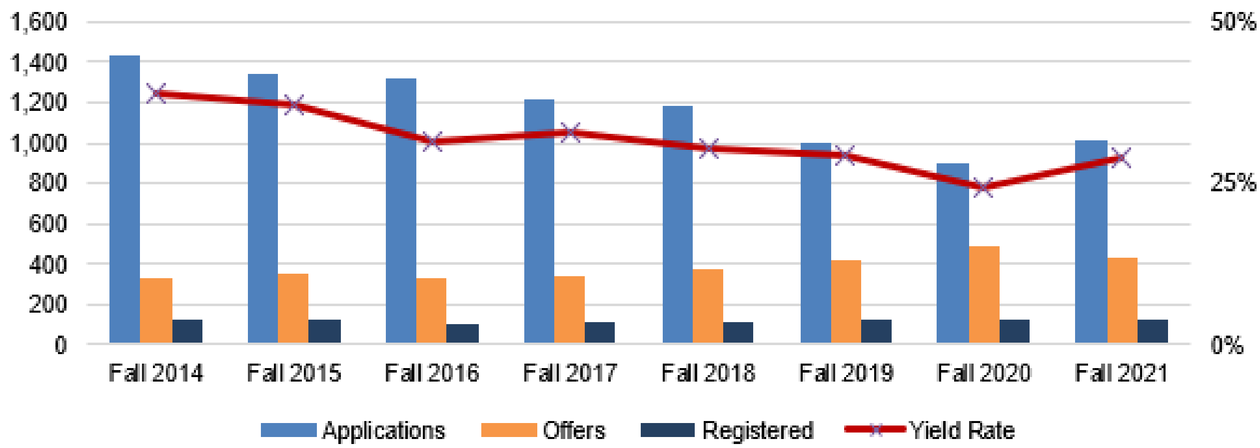
In summary, all of the above data reflects that there has been no significant change to the global composition or quality of our undergraduate student body over previous years across the Faculty, and suggests that there has not been any significant impact in domestic or international undergraduate enrollments resulting from disruptions related to COVID-19.

1.4 Positioning of the Department of Civil & Mineral Engineering within the Faculty of Applied Science & Engineering

1.4.1 Undergraduate Programs

In reviewing the Faculty data noted above against the department-specific metrics provided via the University's Quality Assurance Process (Fig. 1.6 below), we see that the yield and number of incoming first year undergraduate students in Civil Engineering has remained fairly stable and is on par with that of the Faculty.

Figure 1.6 Applications, Offers, Registrations Civil Engineering, 2014 to 2021



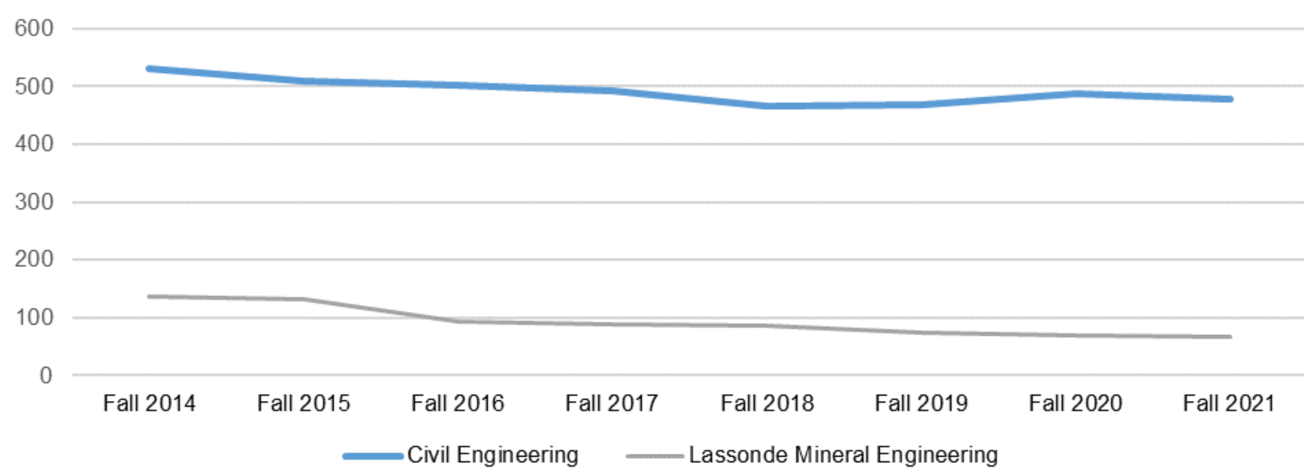
However, Table 1.3 below shows that the number of applications and corresponding registrations in the Lassonde Mineral Engineering program have fluctuated. For example, there was a total of 165 applications to the program in 2014, resulting in 29 first year registrations. This has since retracted to a total of 52 applications in 2021, resulting in 24 first year registrations. Our analysis of this will be examined in subsequent sections of this report. Nevertheless, our combined overall yield for first year registrations is on par with that of the Faculty, with the department yield rate resting at 29.1% and the Faculty at 29.3%.

Table 1.3 Department of Civil & Mineral Engineering Applications, Offers, Registrations, 2014 to 2021

Program		Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	Fall 2019	Fall 2020	Fall 2021
Civil	Applications	1,267	1,194	1,219	1,131	1,114	946	854	958
Engineering	Offers	248	247	242	263	264	334	402	346
	Registrations*	97	93	82	89	84	91	102	103
	Registered / Offered Yield	**39.1%**	**37.7%**	**33.9%**	**33.8%**	**31.8%**	**27.2%**	**25.4%**	**29.8%**
Mineral	Applications	165	148	99	85	73	53	45	52
Engineering	Offers	77	102	89	81	114	87	92	90
	Registrations	29	37	22	24	31	32	19	24
	Registered / Offered Yield	**37.7%**	**36.3%**	**24.7%**	**29.6%**	**27.2%**	**36.8%**	**20.7%**	**26.7%**
Total	Applications	1,432	1,342	1,318	1,216	1,187	999	899	1,010
Dept.	Offers	325	349	331	344	378	421	494	436
	Registrations*	126	130	104	113	115	123	121	127
	Registered / Offered Yield	**38.8%**	**37.2%**	**31.4%**	**32.8%**	**30.4%**	**29.2%**	**24.5%**	**29.1%**

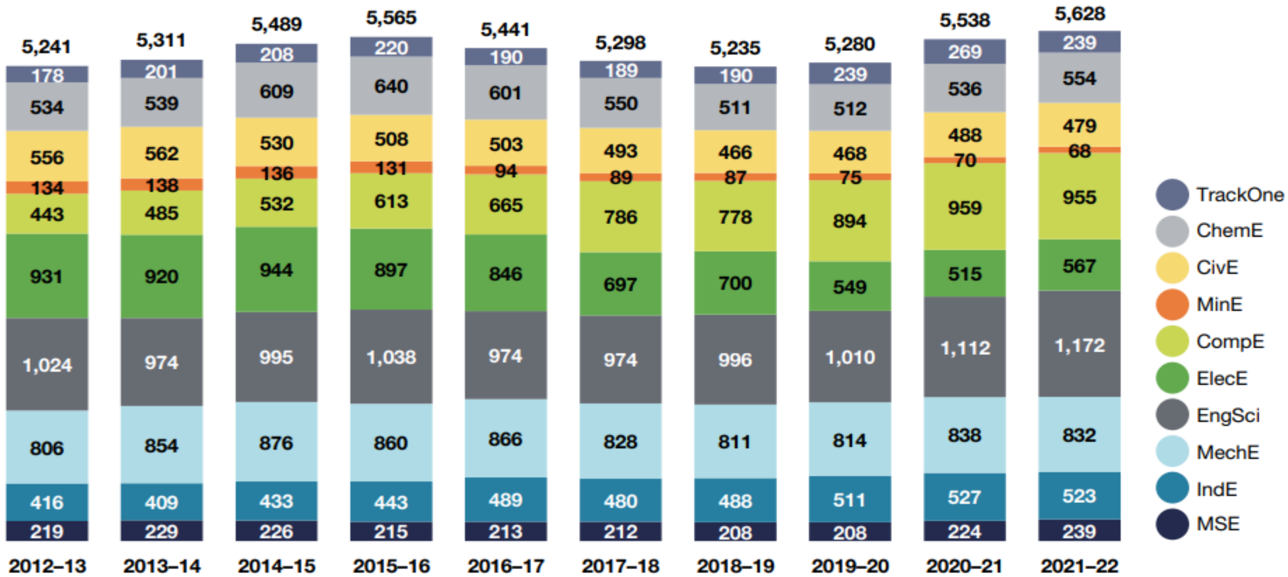
In terms of overall enrollment in our undergraduate programs, enrollment in the Civil Engineering program has fluctuated slightly from 530 students enrolled in 2014 and resting at a total of 479 in 2021 (Figure 1.7). Within the Lassonde Mineral Engineering program, we see a total of 136 enrollments counted in 2014 with a spiral down to a total of 68 enrollments in 2021, for a total undergraduate enrollment of 547 counted in Fall 2021.

Figure 1.7 Department of Civil & Mineral Engineering Enrolment by Program, 2014 to 2021



Comparing this to the Faculty total of 5,628 enrollments counted in the same year (Fig. 1.8), enrollment in the undergraduate programs offered through the CivMin department represents approximately 9.72% of total Faculty undergraduate enrollments. There are pathways for First-Year undergraduate students to enter the Faculty (nine distinct programs plus one undeclared pathway entitled “TrackOne”) demonstrating that the Department’s undergraduate constituency within FASE is equitable to all other Faculty units.

Figure 1.8 All U of T Engineering Undergraduates by Program, 2012-2013 to 2021-2022

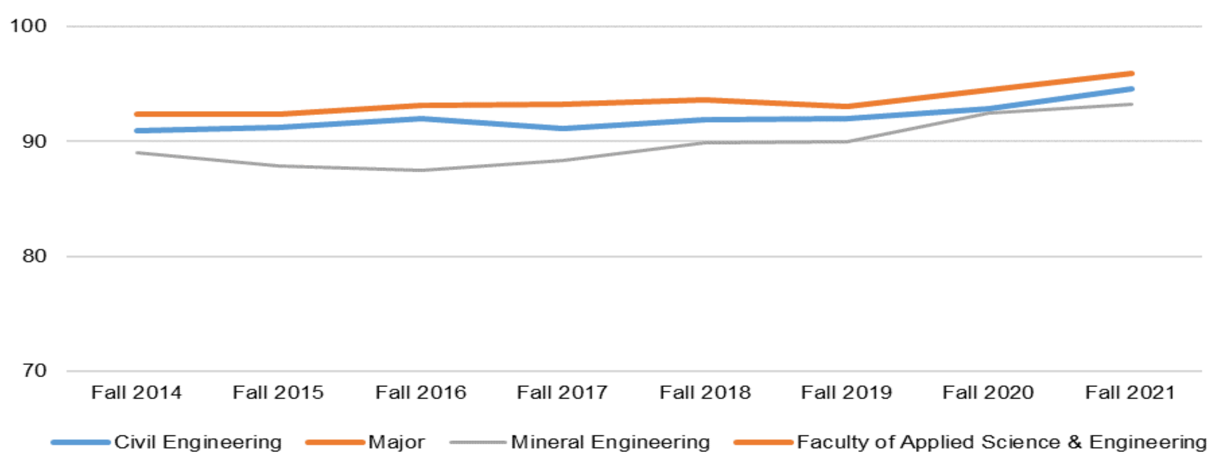


Note 1: Student counts are shown as of November 1.

Note 2: Includes full- and part-time students and those working full time through the Professional Experience Year Co-op Program (PEY Co-op). Does not count students with special (non-degree) status. Students counts shown as of November 1.

If final year secondary school GPA is a dependable indicator of academic acuity, then the quality of applicants to the Civil Engineering and the Lassonde Mineral Engineering undergraduate programs is also equitable to the Faculty average. The grade level average for incoming Civil Engineering students in Fall 2021 was 94.6%, for Lassonde Mineral Engineering students it was 93.2%. The median across the Faculty averaged at 95.9% (Fig. 1.9)

Figure 1.9 Entering Averages of Ontario Secondary School Students - Department of Civil & Mineral Engineering, 2014 to 2021

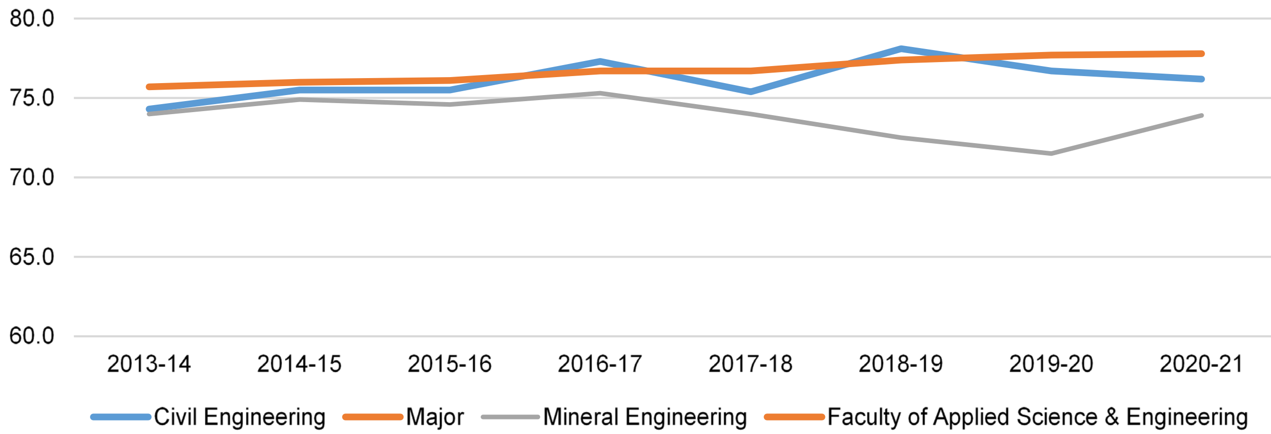


Note 1: Entering averages are based on annual Admissions Committee reports to Faculty Council (November).

Note 2: Mean Entering Averages for Ontario secondary school students (only) are based on final grades in Chemistry, Calculus & Vectors, Physics, English (if required), Advanced Functions/Mathematics of Data Management/Biology/Earth & Space Science and sixth best grade 12 U/M course.

Projecting this comparison forward to final-year achievement (Fig. 1.10) we see that the grade point average for Civil Engineering graduating students in 2020-21 registered at 76.2% and at 73.9% for Lassonde Mineral Engineering students. The Faculty average in the same year was 77.8%.

Figure 1.10 Final-Year Achievment of Undergraduate Students - Department of Civil & Mineral Engineering, 2014 to 2021



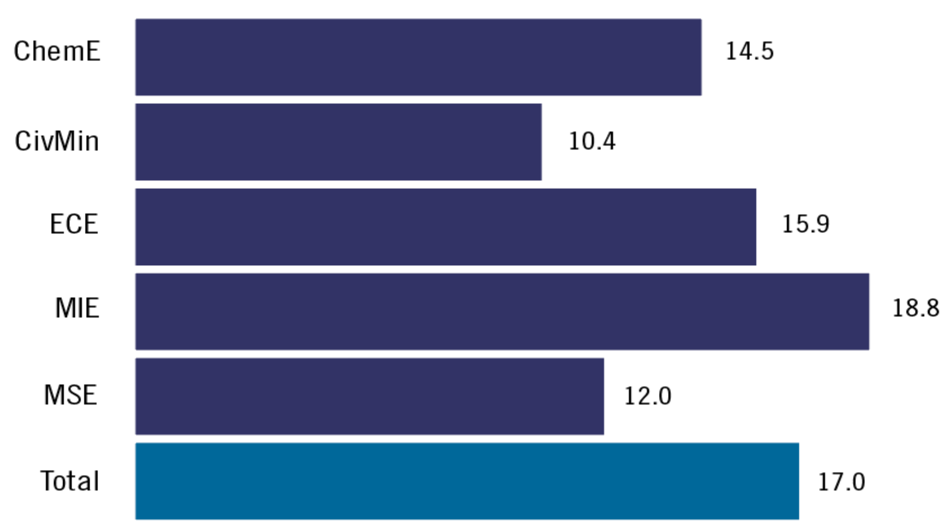
Note 1: The academic year consists of Fall, Winter, Summer terms. For example, the 2020-21 academic year consists of Fall 2020, Winter 2021 and Summer 2021 terms.

Note 2: Includes all courses taken by students in their fourth year of study (year of study is independent of calendar year).

Note 3: In cases where students repeated a course or a year, the higher average is used.

With respect to student-to-faculty ratios, while the Faculty average has been documented at 17.0, the ratio of 10.4 within the Civil and Mineral Engineering department represents the lowest among all cognate engineering departments (Fig. 1.11).

Figure 1.11 U of T Engineering Undergraduate Student-to-Faculty Ratios by Academic Area, 2021–2022



1.4.2 Graduate Programs

As with the undergraduate comparisons shown above, data provided via the FASE 2022 “By the Numbers” annual report demonstrates the positioning of the Civil and Mineral Engineering department with respect to our graduate programs (Table 1.4).

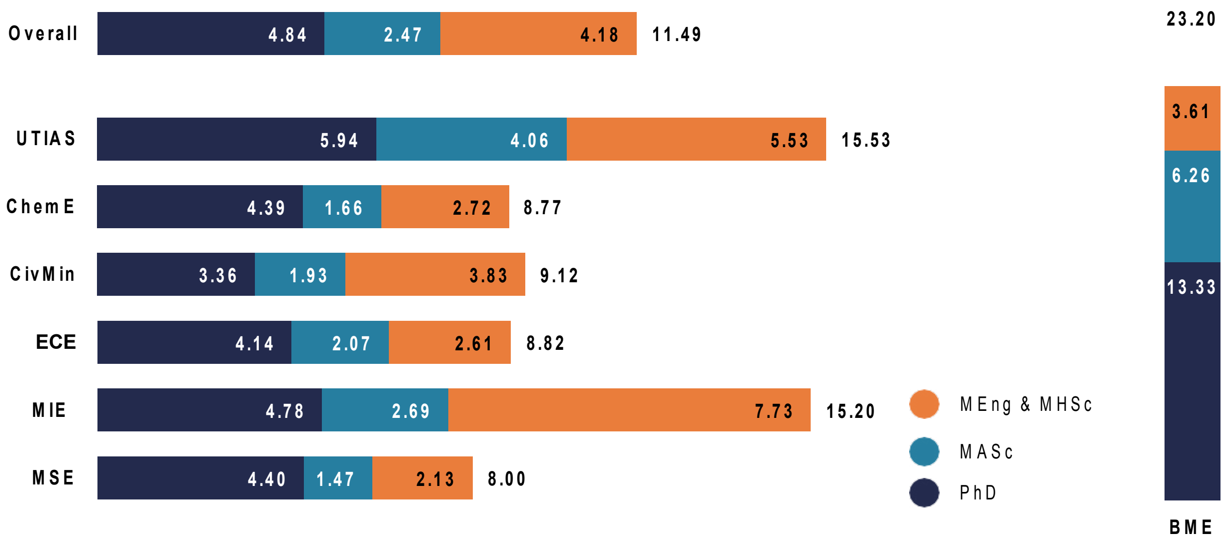
In 2021-22 the total graduate enrollment across FASE reached 2,869.6 FTE. Of this, graduate students participating in CivMin programs accounted for 396.7 FTE, or 13.8% of the Faculty total. This is on par with cognate departments of similar size, for example the Department of Chemical Engineering & Applied Chemistry (which is most closely aligned in terms of department size) accounts for 8.3% of the Faculty graduate student FTE. Conversely, the Department of Mechanical & Industrial Engineering (MIE), which is the Faculty’s largest department (and approximately twice the size of CivMin in all operational aspects) accounts for a total of 28.3% FTE.

Table 1.4 Graduate Enrolment by Full-Time Equivalent (FTE) and Headcount (HC) by Academic Area, 2012-2013 to 2021-2022

		UTIAS	BME	ChemE	CivMin	ECE	MIE	MSE	Total
2012–13	**FTE**	146.7	208.3	193.2	243.3	504.8	387.2	68.2	**1,751.7**
	HC	153	209	203	279	565	453	71	**1,933**
2013–14	**FTE**	162.1	219.0	209.9	290.5	509.8	436.2	90.9	**1,918.4**
	HC	167	219	219	322	556	488	93	**2,064**
2014–15	**FTE**	182.4	228.0	238.0	293.1	531.5	511.2	80.3	**2,064.5**
	HC	188	228	245	312	577	563	81	**2,194**
2015–16	**FTE**	143.2	241.0	253.0	299.4	591.5	532.9	79.0	**2,140.0**
	HC	146	241	260	326	637	570	79	**2,259**
2016–17	**FTE**	178.2	269.0	245.0	306.3	577.0	580.3	92.3	**2,248.1**
	HC	181	269	252	335	619	616	93	**2,365**
2017–18	**FTE**	170.1	296.0	246.7	313.0	551.5	602.8	94.9	**2,275.0**
	HC	175	303	253	348	597	642	97	**2,415**
2018–19	**FTE**	191.4	283.3	219.5	304.0	618.8	658.0	94.9	**2,369.9**
	HC	197	291	223	332	658	700	97	**2,498**
2019–20	**FTE**	226.2	327.1	235.0	349.9	630.2	641.8	95.6	**2,505.8**
	HC	236	332	242	380	668	681	97	**2,636**
2020–21	**FTE**	258.8	350.9	229.0	371.8	613.8	657.8	101.9	**2,584.0**
	HC	270	353	236	404	653	711	104	**2,731**
2021–22	**FTE**	279.6	360.5	239.0	396.7	664.0	812.6	117.2	**2,869.6**
	HC	288	364	246	424	706	863	120	**3,011**

As each of our graduate programs is assessed by UTQAP on an individual program basis, data respective of applications, offers and registration yields will be addressed separately within the Graduate Programs section of this report.

Figure 1.12 Full-Time Equivalent Graduate Student-to-Faculty Ratios by Academic Area and Degree Type, 2021-2022



In Figure 1.12 above, we see a comparison of student-to-faculty ratios by academic area and degree type, with CivMin ratios averaging 9.12 FTE, proportionate to the Faculty's overall average of 11.49 graduate students per faculty.

A comparison of FASE's graduate student funding commitments is depicted in Figure 1.13 below, showing that the total amount of funding apportioned to graduate students in the CivMin department in 2020-21 amounted to $7.2M, representing approximately 12.5% of the Faculty total of $57.5M. Again, measuring this against cognate departments of both similar and greater size, Chemical Engineering accounts for 9.1%, and MIE accounts for 23.1%.

Figure 1.13 Graduate Student Funding by Category and Academic Area, 2020-2021

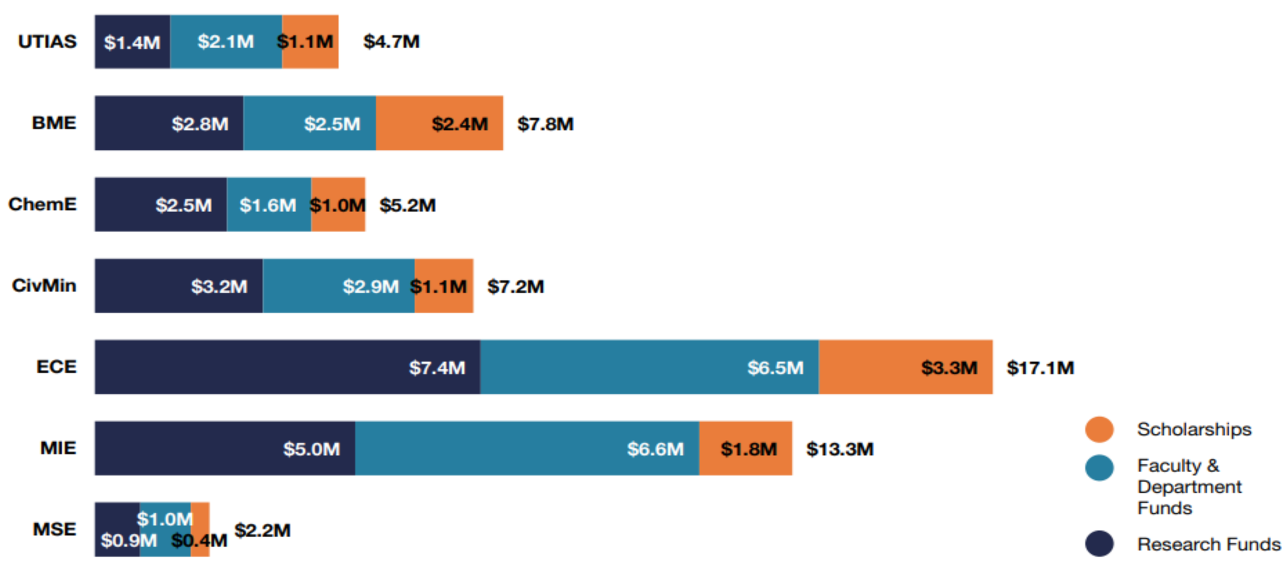


Table 1.5 Time to Completion for FASE PhD, MASc, MEng and MHSc Students, 2012–2013 to 2021–2022

	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22
PhD	5.3	5.2	5.3	5.3	5.3	5.0	5.3	5.0	5.3	5.3
MASc	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
MEng & MHSc (FT)	1.3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
MEng (ExtFT)			1.3	1.7	1.7	1.7	1.7	1.7	1.7	1.7
MEng (PT)	2.0	2.0	2.0	2.0	2.3	2.0	2.0	2.0	2.0	2.0

Table 1.5 above shows the average time to completion for all graduate programs across the Faculty over a 10-year cycle. In 2021-22 the average time to completion for PhD programs was 5.3 years, while full-time MASc and MEng programs were completed within the requisite program timelines of two and one years, respectively. This correlates with the Department's average time to completion by program, tabulated in Table 1.6 below and showing that the departmental averages of all graduate programs match that of the Faculty.

Table 1.6 Time to Completion for Graduate Students - Department of Civil & Mineral Engineering, 2012-2013 to 2021-2022

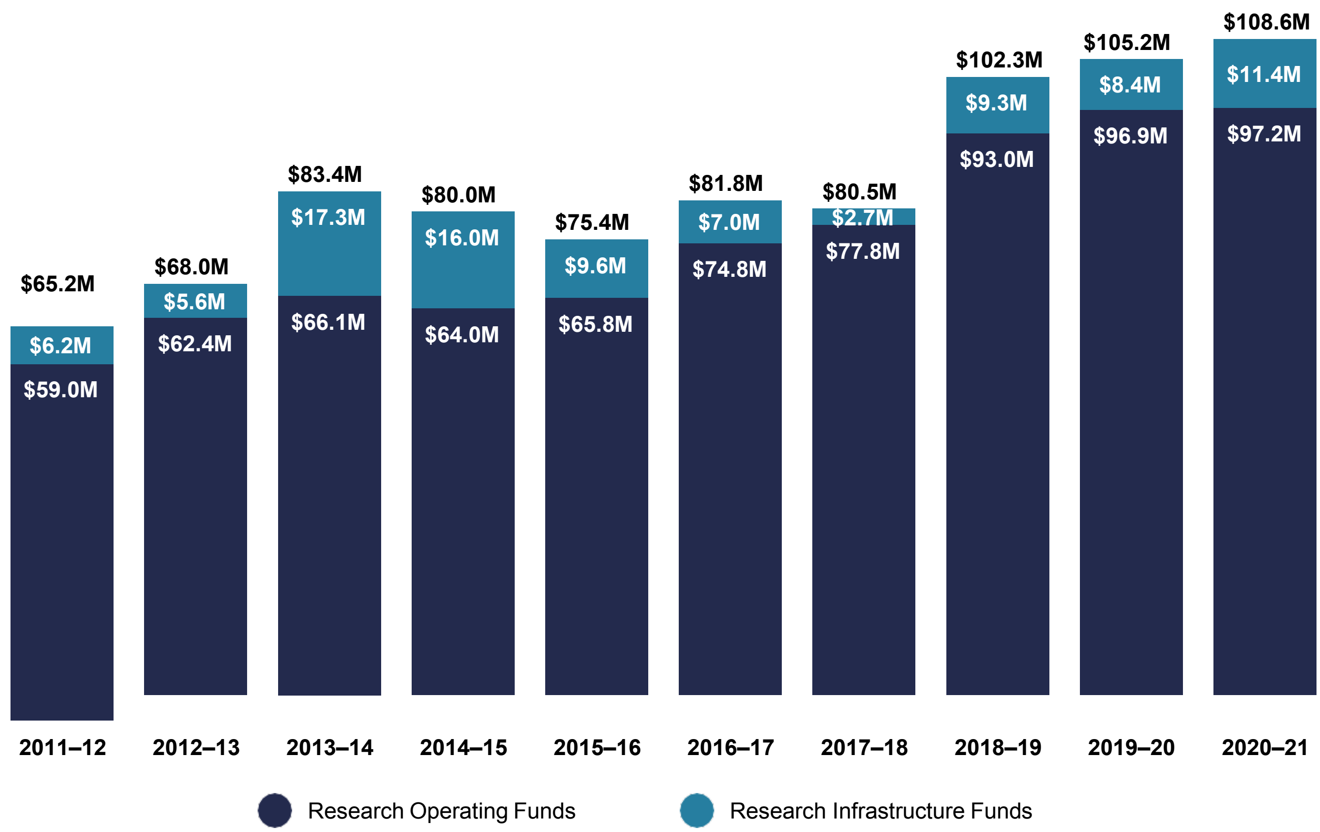
	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22
PhD	5.3	5.0	5.3	5.3	5.7	5.0	5.2	4.3	5.3	5.7
MASc	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
MEng (FT)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
MEng (Ext FT)			1.3	1.7	1.3	1.3	1.3	1.3	1.3	1.5
MEng (PT)	2.0	2.0	1.7	2.0	2.2	2.0	1.7	2.3	2.2	2.0
MEngCEM (FT)			1.3	1.3	1.3	1.3	1.3	1.3		1.0
MEngCEM (Ext FT)						1.3	1.5	1.7	1.3	1.7

Pertinent aspects relational to assessing the quality and performance of our graduate programs will be discussed in detail within the Graduate Programs section of this report.

1.4.3 Faculty/Research

In 2020-21 the Faculty's total research funding, inclusive of both infrastructure and operating funds, amounted to $108.6M, with $11.4M apportioned to research infrastructure and $97.2M dedicated to research operations (Fig. 1.14).

Figure 1.14 Total Research Funding (Infrastructure + Operating), 2011-2012 to 2020-2021

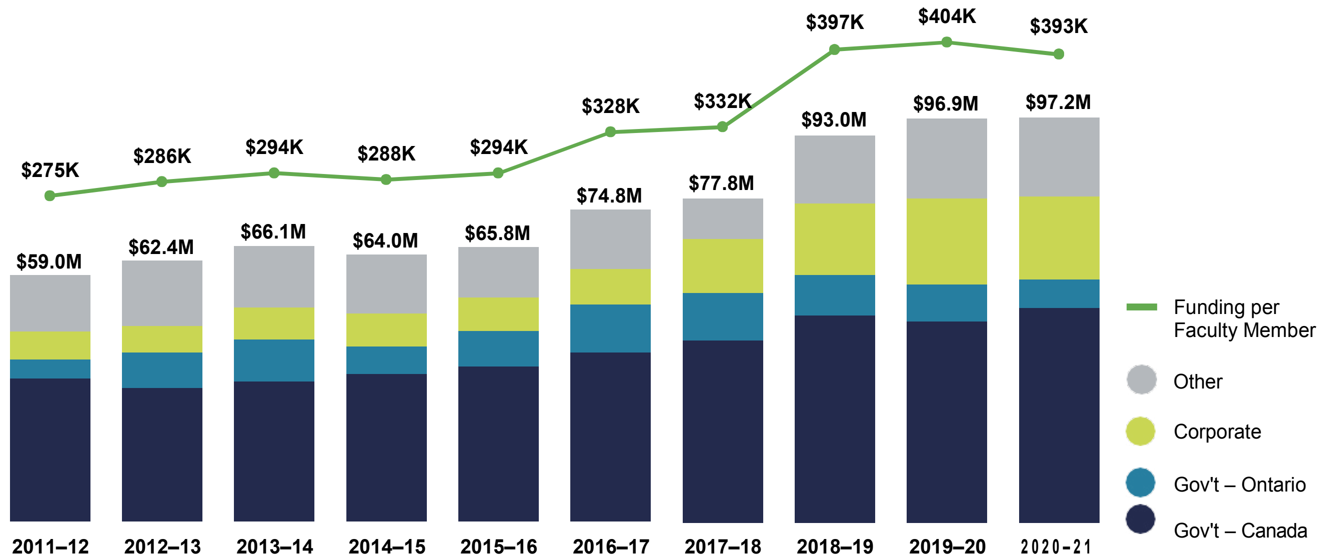


Note 1: Data is based on grant years (April to March). The figures in this chapter report research funding the Faculty received in 2020–2021. Because it takes some time after the completion of a fiscal year for research funding data to become final, this is the most recent year for which data are available.

Note 2: Research operating funding excludes grants received under the following research infrastructure programs: Canada Foundation for Innovation (except the CFI Career Award); NSERC Research Tools & Instruments program for faculty; Ontario Innovation Trust; and Ontario Research Fund – Research Infrastructure.

This further translates to an across-the-Faculty average of $393K per faculty member (Fig. 1.15)

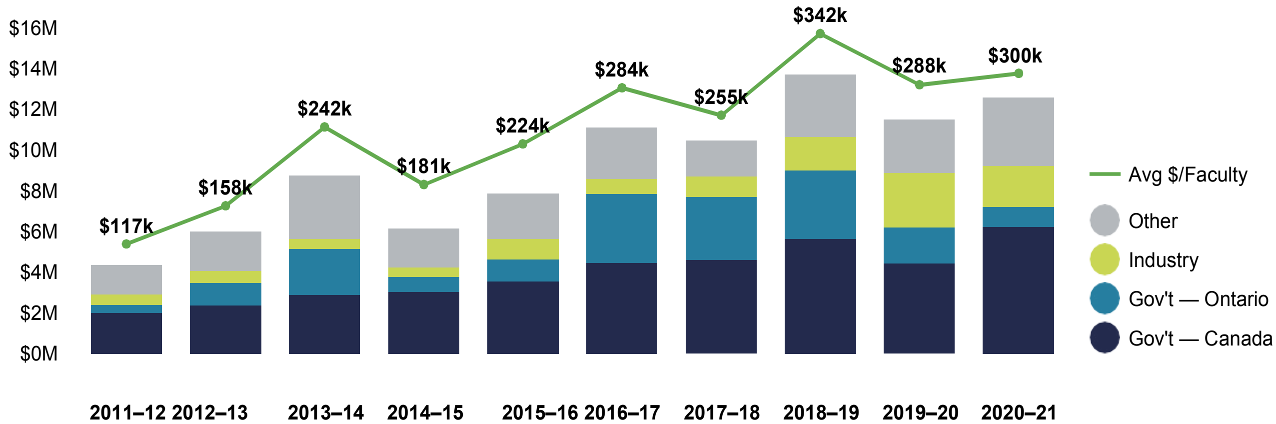
Figure 1.15 Research Operating Funding by Year, Source and Funding per FASE Faculty Member, 2011-2012 to 2020-2021



	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Funding per Faculty Member
2011–12	$34,284,430	$4,535,363	$6,702,708	$13,507,723	**$59,030,224**	$274,559
2012–13	$32,008,870	$8,511,021	$6,277,980	$15,621,407	**$62,419,278**	$286,327
2013–14	$33,553,784	$10,084,984	$7,749,947	$14,683,976	**$66,072,691**	$293,656
2014–15	$35,298,439	$6,661,150	$7,917,673	$14,075,827	**$63,953,090**	$288,077
2015–16	$37,246,309	$8,462,936	$7,952,218	$12,090,798	**$65,752,260**	$293,537
2016–17	$40,620,860	$11,388,721	$8,547,459	$14,244,259	**$74,801,300**	$328,076
2017–18	$43,815,559	$11,391,063	$13,007,020	$9,552,343	**$77,765,985**	$332,333
2018–19	$49,680,508	$9,831,591	$17,153,282	$16,293,418	**$92,958,799**	$397,260
2019–20	$48,300,680	$8,998,584	$20,522,389	$19,033,630	**$96,855,282**	$403,564
2020–21	$51,515,634	$6,894,569	$19,910,850	$18,848,924	**$97,169,976**	$393,401

Comparatively, the average amount of research funding secured per faculty member within the Department of Civil & Mineral Engineering in 2020-21 rested at $300K (Fig. 1.16).

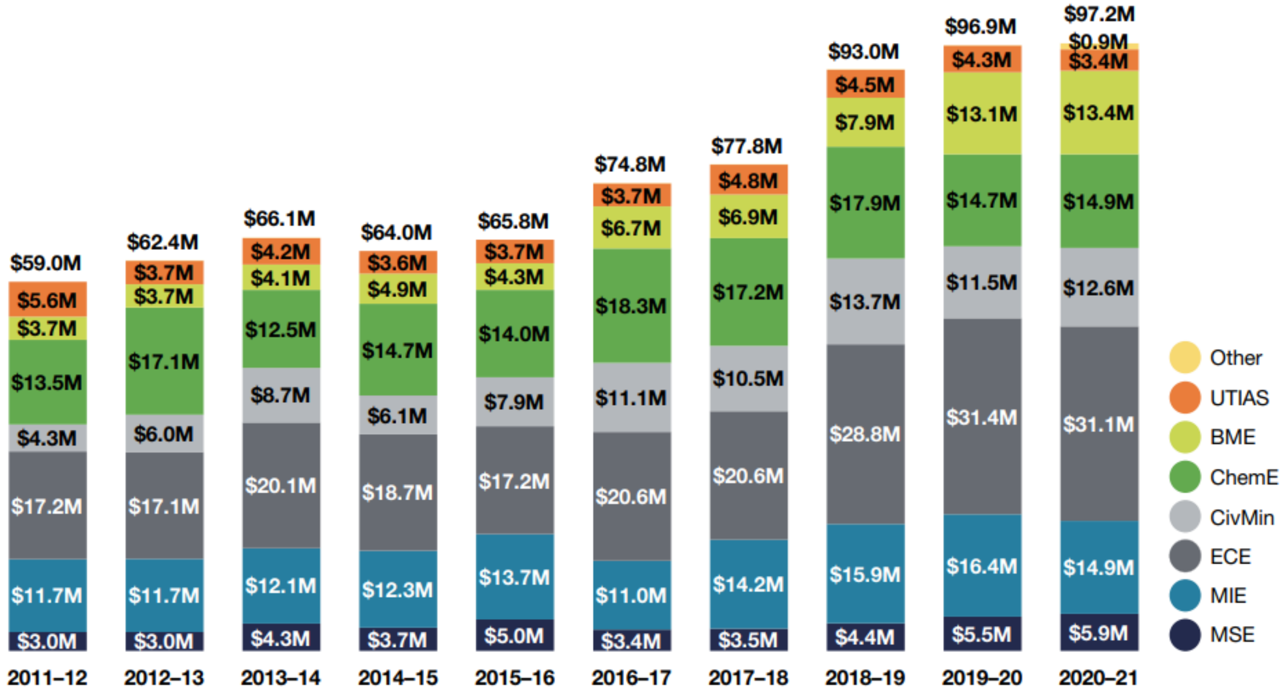
Figure 1.16 Research Operating Funding by Year, Source and Funding per Faculty Member - Department of Civil & Mineral Engineering, 2011-2012 to 2020-2021



	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Avg $/Faculty
2011–12	$1,991,794	$402,645	$515,246	$1,428,083	**$4,337,768**	**$117,237**
2012–13	$2,358,881	$1,121,005	$585,360	$1,941,535	**$6,006,780**	**$158,073**
2013–14	$2,892,286	$2,269,442	$470,776	$3,096,897	**$8,729,400**	**$242,483**
2014–15	$3,037,368	$727,715	$479,896	$1,903,290	**$6,148,269**	**$180,831**
2015–16	$3,531,723	$1,099,445	$1,013,993	$2,209,878	**$7,855,038**	**$224,430**
2016–17	$4,443,039	$3,416,679	$715,923	$2,509,696	**$11,085,336**	**$284,239**
2017–18	$4,613,268	$3,094,772	$991,529	$1,755,047	**$10,454,616**	**$254,991**
2018–19	$5,644,235	$3,360,627	$1,645,296	$3,043,214	**$13,693,372**	**$342,334**
2019–20	$4,434,001	$1,789,098	$2,659,278	$2,623,458	**$11,505,835**	**$287,646**
2020–21	$6,221,666	$991,212	$2,014,331	$3,356,124	**$12,583,333**	**$299,603**

The Department's share of research operations funding amounted to $12.6M, or 12.9% of the Faculty total of $97.2M (Fig. 1.17) .

Figure 1.17 Description of Research Operating Funding by Academic Area, 2011-2012 to 2020-2021



From these metrics we see that, overall, research funding secured within the Department is commensurable with the Faculty average. Detailed analysis of the Department's research portfolio will be addressed in the Research section of this report.

In summary, the foregoing demonstrates the position of the Department of Civil & Mineral Engineering within the Faculty and the University of Toronto in the key areas of undergraduate and graduate enrollment, faculty to student ratio, student success, and quality of research. We believe that the comparisons and data provided throughout show that, overall, our department is performing at a level equal to or above all other academic units of comparable size and structure.

In the following sections we will expand on these aspects as well as examine the unique elements of our program offerings, our research portfolio, and specifics with respect to organizational and financial structure, resources and infrastructure, our internal and external relationships, and our strategic focus for guiding the future directions of the Department.

1.5 Overview of Self-study Process

We began planning for this report in late August, 2022 by establishing a core steering committee comprised of the department Chair, Associate Chairs and senior administrative staff, with additional guidance provided by the Dean's Office. The role of the steering committee was to determine the parameters for the report and to steer the process through to completion.

The members of the steering committee were:

Brent Sleep	Department Chair
Matthew Roorda	Associate Chair – Research
Marianne Hatzopoulou	Associate Chair – Graduate Studies
Evan Bentz	Associate Chair – Undergraduate, Civil Engineering
John Harrison	Associate Chair – Undergraduate, Lassonde Mineral Engineering
Michelle Deeton	Director, Administration and Finance
Loreto Caprara	Director, Technical Services (to December, 2022)
Nelly Pietropaolo	Director, Student Services and External Relations
Teresa Miniaci	Executive Assistant to the Department Chair
Galina Nikitina	Communications Assistant

The UTQAP data provided by the Office of the Provost was received in early September and was reviewed by all vested parties throughout the review process. The Self-study exercise itself was introduced and discussed at a departmental meeting held later that year. This was followed by a series of one-on-one interviews conducted with all key staff members. Notes from the interviews were synthesized to establish a foundation of commonly shared opinions and recommendations to inform the direction of the report. Additional input was gathered through a series of surveys distinctly targeted to each of our stakeholder groups. Copies of the surveys can be viewed in appendix (see Appendices A.5 through A.9)

Separate town hall meetings were also held with both the Civil and Mineral Engineering undergraduate students during the early part of the Winter academic session, 2023.

A draft report was then circulated throughout the department in late April, and revisions stemming from the feedback gathered through review of the draft were then incorporated into this report. The revised report was then submitted to the Dean's Office in August, 2023.

Detailed information pertaining to the programs, research activities, and structure of the Department can be found on our website at: [Department of Civil & Mineral Engineering (utoronto.ca)]

1.6 Previous Review Recommendations

The Department underwent its last UTQAP review in 2017-18, under the leadership of Professor Brent Sleep during his first term serving as department chair. At that time the review committee noted nine key recommendations, summarized below.

With respect to administration, the reviewers indicated there is a need for an overarching departmental strategic plan, which may include an overall mission statement, address undergraduate and doctoral enrolment, and identify international peer institutions.

Regarding the facilities assigned to the Department, the reviewers identified variances in the quality and quantity of space available to faculty and students, and in communication about decisions regarding space. The reviewers recommended establishing a “Space Committee” to develop a strategic space plan and to seek ways to improve communications surrounding space decisions.

In general, the reviewers encouraged the Department to formalize administrative processes and to improve communications surrounding staff job expectations and performance review. They also recommended conducting a review of needs, gaps, and workload within the staffing structure, especially in the areas of IT and lab support staff.

In examining the faculty experience within the Department, the reviewers noted gaps in mentorship and feedback surrounding faculty promotion. The reviewers recommended improving the documentation and communications for tenure expectations, and prioritizing untenured faculty space, resources and feedback.

With respect to our academic programs, examination of the Department’s undergraduate programs led to a recommendation for the Department to undertake a full-scale curriculum review, chiefly to identify curricular overlap but also to address concerns raised by our undergraduate students with respect to workload. The curriculum review would be a key component of an overarching exercise to articulate a strategic plan that would serve to guide the Department forward.

The reviewers also encouraged the Department to continue its efforts to expand diversity through proactive recruitment of students from traditionally underrepresented groups, and suggested the Department review the promotion and enrollment for the MEng in Cities Engineering and Management with a view to evaluating the overall future direction for the program.

In assessing our research portfolio, the reviewers encouraged the Department to work towards expanding our outreach and exploring more opportunities for industry-sponsored research for students; identifying ways to support undergraduate research engagement; and, supporting growth in cross-departmental research.

Finally, the reviewers suggested increasing alumni and external engagement in advisory boards and improving outreach activities to these groups.

The Department’s progress in responding to these recommendations will be highlighted throughout the pertinent sections of this report. A copy of the full departmental response, detailing our plan of action for addressing the above recommendations, as submitted to the Vice Provost Academic in February 2019, can be found in Appendix A.10: 2018-19 Final Assessment Report and Implementation Plan: Civil and Mineral Engineering.

Our process with respect to curriculum review is detailed in the Undergraduate Programs section of this report.

2. ACADEMIC PROGRAMS

Undergraduate Bachelor of Applied Science (BASc) in Civil Engineering

Undergraduate Bachelor of Applied Science (BASc) in Lassonde Mineral Engineering

Master of Applied Science (MASc) in Civil Engineering

Doctor of Philosophy (PhD) in Civil Engineering

Master of Engineering (MEng) in Civil Engineering

Master of Engineering in Cities Engineering and Management (MEng CEM)

2.1 Overview

The University of Toronto's stated mission is "*dedicated to fostering an academic community in which the learning and scholarship of every member may flourish, with vigilant protection for individual human rights, and a resolute commitment to the principles of equal opportunity, equity and justice.*" [1]

The mission of the Department of Civil and Mineral Engineering is aligned to the U of T mission through the scope and delivery of our suite of academic programs, offered in conjunction with our robust research concentrations. We will endeavour to demonstrate this alignment throughout the following subsections in which we define the specifics of each program.

2.2 Undergraduate Programs

2.2.1 Bachelor of Applied Science (BASc)

The Department offers two distinct programs which confer the Bachelor of Applied Science (BASc) degree upon successful completion, in the disciplines of civil engineering and mineral engineering. Some of the core curricular requirements of the two programs are mutually required within each program, some requirements are comparable within each, while each program also branches off to provide in-depth, discipline-specific focus and instruction. Through a wide-range of technical electives available for student selection during the fourth year of each program, students are able to build upon their core studies to align their areas of concentration with their select academic objectives.

1 From the Statement of Institutional Purpose, adopted by Governing Council, October 15, 1992.

Civil Engineering Program

The practice of civil engineering encompasses much of what defines modern civilization and impacts our quality of life in multiple ways. Civil engineers are concerned with the design, construction and operation of buildings, bridges and other large-scale structures, public works, roads, railroads, and public transportation systems, water supply and water treatment processes, natural resource protection, and issues of environmental stewardship. The Civil Engineering undergraduate program at the University of Toronto is designed to complement technical training with learning opportunities to address these challenges. Our physical positioning within the urban fabric of the city of Toronto provides a wealth of opportunity for our students to explore civil engineering concepts and practices within a vibrant, living lab environment.

The curriculum introduces and builds upon concepts in urban engineering, construction management, hydraulics and hydrology, water and wastewater treatment processes, structural design, urban transportation, building science, and geotechnical engineering. Throughout, courses dedicated to exploration of materials, examination of environmental factors, and development of sustainable energy systems enhance student knowledge and understanding. In-depth technical elective courses offered in the fourth year of the program provide students with opportunity to focus in their selected area of specialization. Through our roster of courses students are prepared to address and create solutions that will directly impact quality of life everywhere, whether this be rebuilding deteriorating urban infrastructure, creating new structures to withstand natural disasters, developing advanced technologies for managing complex transportation networks, supplying clean water, ensuring the responsible disposal of wastewater, or building alternative energy systems for a more efficient and healthier living environment.

Lassonde Mineral Engineering Program

Mineral engineering is that branch of engineering concerned with the application of scientific and technical knowledge to the search for, and production of, minerals from naturally occurring surfaces, underground or below-water deposits. Mineral engineering encompasses those activities necessary to extract and process natural mineral resources. The Lassonde Mineral Engineering program at the University of Toronto addresses the entire scope of minerals engineering: geology and mineral exploration, analysis and design of surface and underground excavations, mechanical and explosive excavation of geological materials, planning and management of mines and quarries, processing of metallic and non-metallic minerals, safety and environmental protection, and financial aspects of minerals operations.

Nevertheless, what distinguishes the Lassonde Mineral Engineering program from other mining programs is our broad approach to the discipline, as we see this more as the applied science of our interactions with the planet. Our goal is to prepare our mineral engineering students to lead the way in making mining practices more sustainable, safe and productive. Areas of focus introduced through our specialized undergraduate courses encompass concepts in mineral exploration, mine design and management, mineral processing, environmental management, and mining finance. The program is rooted in an interdisciplinary approach, incorporating concepts and techniques from mathematics, physics, chemistry, geology and economics; in the setting of the University of Toronto it is thus both interdepartmental and interfaculty, with the Departments of Civil & Mineral Engineering, Earth Sciences, and Materials Science & Engineering contributing to the program. As Toronto is a world centre for mining and mining finance, the program is able to maintain close links with the minerals industry, and thus invites recognized experts from various branches of the industry to deliver a range of guest lectures on specialized topics within the curriculum.

2.2.2 Undergraduate Programs: Admissions and Program Structure

Admissions

Admissions to undergraduate programs at the University of Toronto are governed by the academic ranking and targets as set out by the Faculty as a whole. The process is managed by a Faculty committee, to which a departmental faculty representative is appointed, assisted by our recruitment and admissions coordinator. The Registrar's office is responsible for handling the associated administrative processes on behalf of all departments.

Academic admission requirements vary slightly depending on whether the applicant is entering university directly from an Ontario-based secondary school, from an out of province institution, or from an institution located outside of Canada. There are also some minor variations applicable to candidates who are seeking to transfer to U of T directly from another institution, or as a mature student. Nevertheless, our admission requirements are generally consistent with those of our peer Canadian institutions – six final year high school credits: English (ENG4U), Calculus and Vectors (MCV4U), Chemistry (SCH4U), Physics (SPH4U) Advanced Functions (MHF4U), and one additional U or M level course. Proof of English proficiency is also required.

However, academic standing is never a sole determinant for offer of admission to our undergraduate programs. In fulfilling our objectives to steer future engineers towards global stewardship and to be leaders and exemplary contributors to society, factors such as extra-curricular and volunteer activities, personal interests and hobbies, and previous practical experience are equal in importance to our assessment of applicants. As such, in addition to submitting the standard application forms administered via university application facilitators (such as the Ontario Universities' Application Centre or the U of T's International Application process), all eligible applicants are requested to also activate an online presence through joining the "Engineering Applicant Portal" and submitting a student profile which elaborates on such elements as the applicant's educational goals, their extracurricular activities, and submission of a personal profile. The personal profile requires applicants to answer three randomly selected questions (generated via the portal), with one of the questions to be answered traditionally in written form, and the other two answered via video capture. Detailed information regarding the application process can be viewed at How To Apply - Future Engineering Undergraduates (utoronto.ca)

Characteristics of the First-Year Class 2022-23

There was a slight decline in the number of international students entering first-year across the Faculty in the 2020-21 and 2021-22 admission cycles, which we assess was largely due to impacts resulting from COVID-19 (i.e., delays in visas being processed, issues with travel disruptions, and compliance with overarching COVID-19 protocols.) As world health conditions have become somewhat more stabilized this trend is again shifting upwards in 2022-23.

Table 2.1 Characteristics of the First-Year Class, 2022-23

Program	FT	PT	Total	Domestic	Int'l	Female	% female
Chemical	132	1	133	93	40	71	45%
Civil	96	1	97	75	22	37	43%
Computer	136	0	136	83	53	54	39%
Electrical	94	1	95	65	30	28	44%
Eng Sci	321	0	321	246	75	121	45%
Industrial	68	0	68	49	19	26	43%
Materials	63	1	64	41	23	14	30%
Mechanical	146	2	148	103	45	54	37%
Mineral	36	0	36	28	8	3	14%
Track One	205	0	205	137	68	85	37%
Total	1297	6	1303	920	383	493	40%

First-year registration in the Civil Engineering program in the current academic cycle (2022-23) is 97 students of which 22, or 22.7%, are international students. The composition of the Mineral Engineering program is similar with eight out of 36, or 22.5%, of students comprising international registrations.

Additionally, the above Faculty-wide statistics tabulating First-year undergraduate enrollment of women students show continued growth on a modest scale, increasing from 33% in 2017 to 38.8% in 2022. Within the Civil Engineering program this ratio has remained fairly stable, resting at 43% in 2022. However, the proportion of women in the Mineral Engineering program has declined, moving from approximately 37% in 2019 to 14% in 2022, noting however that the class size is small resulting in significant year-to-year variation.

TrackOne (Undeclared)

While first-year applicants are requested to indicate their first program of choice, those who are uniquely undecided may opt to enter the Faculty via the TrackOne undeclared program option, in which students enter a general first year and postpone decision on their chosen field of study until second year. The advantage is that students have the opportunity to explore aspects of subject areas from across all eight core programs before committing to a defined pathway of practice. Eligibility to progress to a program of choice in second year is dependent upon the student achieving a minimum of 60% in both semesters of their first year.

Since its inception in 2007-08 interest in the TrackOne option has increased exponentially such that, exclusive of the Engineering Science program, it is now the largest admissions pathway for incoming first-year students. As a result, FASE departments undergo some collegial competition to capture a proportionate share of these students. In our 2017 Self-study we assessed that the number of TrackOne students choosing Civil & Mineral Engineering was low relative to the number of students available for program transfer, and so we determined to make more concerted efforts to inform TrackOne students of the potentials inherent in practice in both civil and mineral engineering. Since then, the Department has made proactive efforts to inform, invite, and engage TrackOne students in our departmental events (i.e., guest seminars, student club activities, sponsored team competitions.)

In terms of direct outreach, the TrackOne curriculum includes a second term course entitled "Intro to Engineering" in which each of the eight core programs of the Faculty are invited to make a one-hour presentation to highlight the objectives and potentials offered through their respective program. This is the singular opportunity FASE departments have in which to interact directly with the TrackOne cohort prior to selection of their program of choice.

Although we have seen some minor growth in our proportional share of TrackOne students over the past five years, sustained monitoring of transfer activity has shown that the majority of eligible TrackOne students trend towards the undergraduate programs offered by MIE and ECE. We do expect to see continued growth in our proportional share of transfers over time, but understand that this growth will be steady-paced and driven by perceived postgraduate employment trends.

The table below demonstrates the sustained transfer preferences of TrackOne students entering second-year in FASE undergraduate programs.

Table 2.2 Student Transfers from Track One, 2017 to 2022

Candidacy Program	New Program	2018-19	2019-20	2020-21	2021-22	2022-23	Grand Total
TrackOne	ChemE	14	11	11	15	8	**59**
	CivE	11	9	18	12	8	**58**
	CompE	63	74	58	85	84	**364**
	ElecE	38	24	34	35	24	**155**
	EngSci	2	2	2	4	2	**12**
	IndE	29	32	38	39	35	**173**
	MinE	2		1		1	**4**
	MecE	31	43	71	38	54	**237**
	MSE	4	6	2	13	6	**31**
Grand Total		**194**	**201**	**235**	**241**	**222**	**1093**

Undergraduate Enrollment Indicators

The following charts compare total enrollments for the Civil and Mineral Engineering undergraduate programs against the Faculty totals, over the past eight academic cycles. In Fall 2021, the total count for the Faculty was 5,628. The count for the Civil & Mineral engineering programs was 547, representing 9.75% of the Faculty total. As these charts show, although the total enrollment numbers have remained fairly consistent throughout these same time periods, within the Department there has been some minor shifting between the number of full-time versus the number of part-time enrollments.

Figure 2.1 Faculty of Applied Science & Engineering Total Enrollment, 2014 to 2021

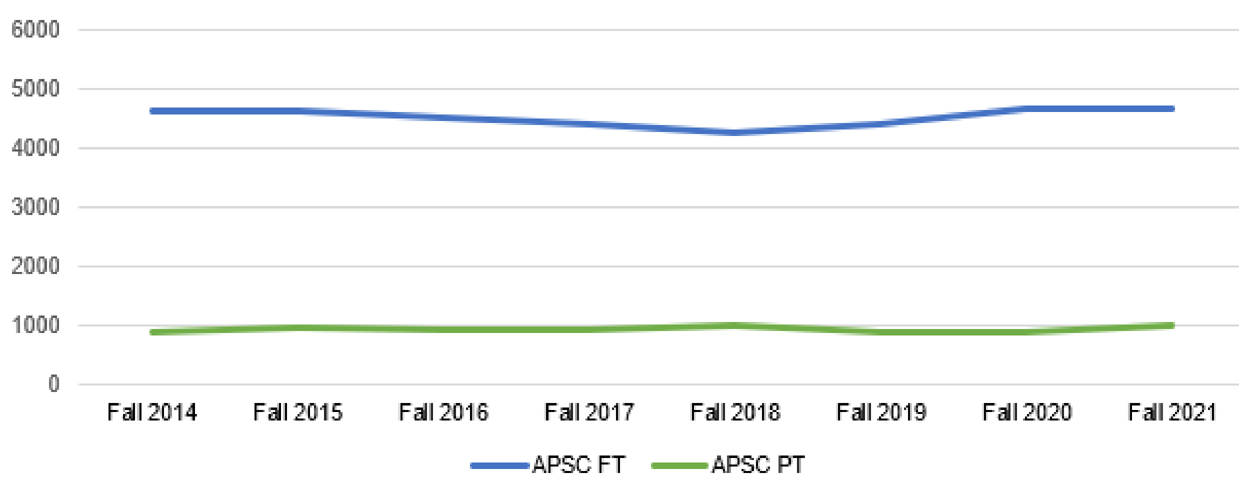
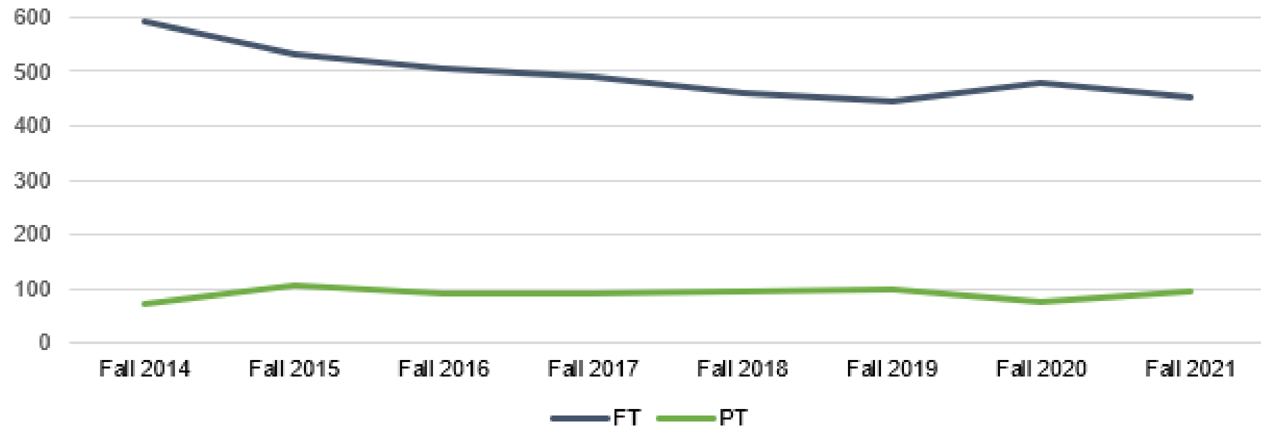
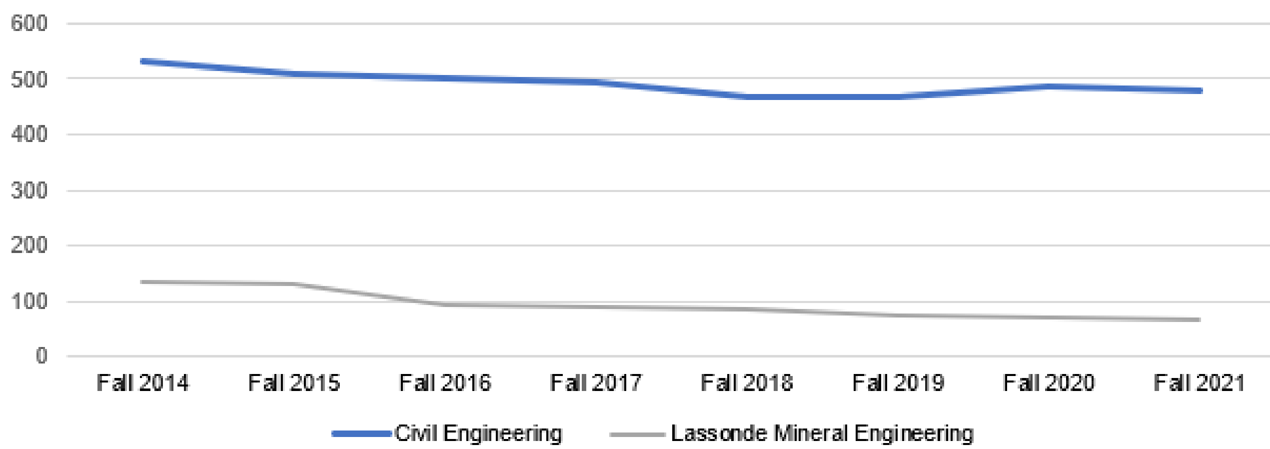


Figure 2.2 Civil and Mineral Engineering Undergraduate Enrollment, 2014 to 2021



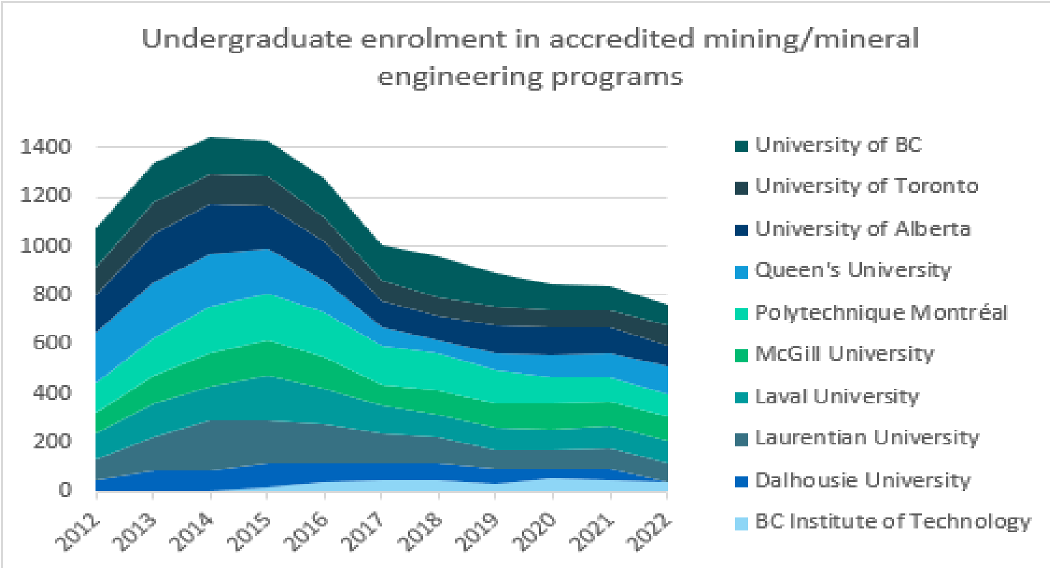
However, in examining enrollment patterns in our undergraduate programs we do see a slight downward trend developing in our Lassonde Mineral Engineering program, as shown in Figure 2.5 below. Nevertheless, this trend does seem to be reversing now, as we currently have 36 students enrolled in first-year of the program (i.e., academic year 2023-24.)

Figure 2.3 Department of Civil & Mineral Engineering, Enrollment by Program, 2014 to 2021



The low enrolment in mineral and mining engineering programs is not unique to our program, as mining programs across the Canada U15 schools have experienced similar enrolment declines from 2014 to 2022. Recent surveys conducted by Teck Resources Limited, a natural resources company headquartered in Vancouver, B.C., and based on responses provided by administrative officers at each of Canada's lead engineering schools, found that enrollments in undergraduate mining programs have been declining for the past several years (Fig. 2.6), with a corresponding decline in the number of degrees awarded over the past six years (Fig. 2.7.)

Figure 2.4 Teck Resources Limited: Talent Pool Survey, 2012 to 2022



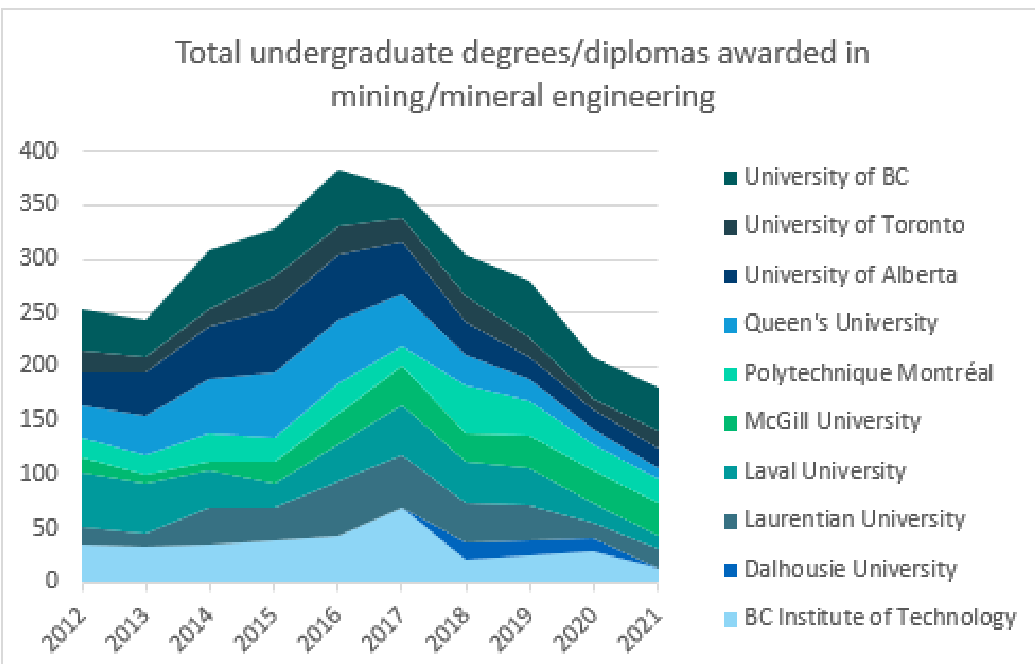
Note 1: Source data is compiled from an Engineers Canada report first published in 2019, supplemented by updated data provided via representatives from the Canada U15 engineering schools in 2022.

Note 2: Methodology for tabulation of data may differ at each institution, e.g. some schools have determined the number of graduates per year based on the entry year versus the exit year; data is therefore representational

Note 3: Schools in Canada continue to see a decline in enrollment after a sharp drop that began in 2016. Total mining enrollment is down 47% compared to the peak eight years ago, in 2014.

Note 4: Data generated by M. Miyoshi, Lead, Campus Talent Acquisition, Teck Resources Limited, November 2022; shown herein with permission.

Figure 2.5 Teck Resources Limited: Talent Pool Survey – New Graduates, 2012 to 2021



Note 1: Compared to enrollment, schools in Canada have seen a more rapid decline in the number of degrees issued annually. Total degrees awarded are down 53% compared to the peak six years ago, in 2016.

Note 2: Data generated by M. Miyoshi, Lead, Campus Talent Acquisition, Teck Resources Limited, November 2022; shown herein with permission

Although this is a national phenomenon, our sense is that employment opportunities within the mining industry will continue to trend upwards as world demand for minerals (particularly lithium and copper) increase. The Department intends to make concentrated efforts to capitalize on this emerging trend in connection with our ongoing recruitment efforts, and with the support of the Faculty, the backing of the U of T Engineering brand, and our location in proximity to Canada's mining hub, we fully expect to see improvement in our enrollment numbers over the next few years.

Departmental leadership has recently established the Lassonde Mineral Engineering Advisory Board to provide guidance on emerging trends within the mining industry that will help inform our ongoing program and curriculum review, and to bridge connections to industry partners who may have an interest in mentoring our LME students, or participating in the experiential aspects of our LME program such as the fourth-year "Mineral Project Design" courses, or the Faculty's "Professional Experience Year" co-op program.

In reviewing the composition of Civil Engineering students across all years of study, we see that international enrollment has remained fairly steady, fluctuating between 29 and 35% over the five-year period 2018 to 2022 (Table 2.3), and resting at 31% in 2022. However, international enrollment in the Lassonde Mineral Engineering program has grown throughout this period, ranging between 21 and 33% (Table 2.4), while the Faculty average over this same time period rested at 36% (Table 2.5).

Table 2.3 International Enrolment - Civil Engineering, 2018 to 2022

Year	Domestic	International	Total	% International
2018	187	77	264	29%
2019	235	99	334	30%
2020	260	142	402	35%
2021	246	100	346	29%
2022	267	113	380	30%
Average	**239**	**106**	**345**	**31%**

Table 2.4 International Enrolment - Lassonde Mineral Engineering, 2018 to 2022

Year	Domestic	International	Total	% International
2018	85	29	114	25%
2019	69	18	87	21%
2020	73	19	92	21%
2021	88	28	116	24%
2022	60	30	90	33%
Average	**75**	**25**	**100**	**25%**

Table 2.5 International Enrolment - Faculty of Applied Science & Engineering, 2018 to 2022

Year	Domestic	International	Total	% International
2018	2,353	1,027	3,380	30%
2019	2,536	1,401	3,937	36%
2020	2,962	1,844	4,806	38%
2021	2,697	1,601	4,298	37%
2022	2,786	1,662	4,448	37%
Average	**2,667**	**1,507**	**4,174**	**36%**

In terms of gender composition of our undergraduate students, the following tables compare the enrolment of women undergraduate students in the Civil and Lassonde Mineral Engineering programs against the Faculty total. While the number of women students enrolled in Civil Engineering are on par with the Faculty average, the Lassonde Mineral Engineering program is, and continues to be, challenged in attracting women to this field of study. We have identified this as a key priority for action in our 2023-28 Strategic Plan.

Table 2.6 Women Undergraduate Enrolment - Civil Engineering, 2018 to 2022

Year	Women	Total	% Women
2018	128	264	48%
2019	115	334	34%
2020	124	402	31%
2021	130	346	38%
2022	144	380	38%
Average	**128**	**345**	**37%**

Table 2.7 Women Undergraduate Enrolment - Lassonde Mineral Engineering, 2018 to 2022

Year	Women	Total	% Women
2018	33	114	29%
2019	18	87	21%
2020	13	92	14%
2021	17	116	15%
2022	27	90	30%
Average	**22**	**100**	**22%**

Table 2.8 Women Undergraduate Enrolment - Faculty of Applied Science & Engineering, 2018 to 2022

Year	Women	Total	% Women
2018	1,563	3,380	46%
2019	1,571	3,937	40%
2020	1,673	4,806	35%
2021	1,690	4,298	39%
2022	1,719	4,448	39%
Average	**1,643**	**4,174**	**39%**

Undergraduate Programs - Structure

For the most part, the first year of study for both the Civil Engineering and the Lassonde Mineral Engineering programs adhere to the prescribed format for all undergraduate engineering programs offered through the Faculty. All courses in each program are core to the program and are designed to provide students with a fundamental understanding of commonly applied engineering principles. Subjects covered include engineering chemistry, materials science, mechanics, calculus (beginner and advanced levels), linear algebra, computer programming fundamentals, and physical chemistry. To facilitate development of communication and technical writing skills, as well as to provide students with a framework for the design process, problem solving, and project management, all first-year students also participate in the two sequence “Engineering Strategies and Practices” course. In the first level of the course (APS111) students are introduced to communication as an integral component of engineering practice, with emphasis placed on producing both team and individually researched technical reports. In the second level (APS112) students are provided with more in-depth exposure to the fundamentals of project management and the design process through preparation of a series of sequential technical reports based on a team defined design project, and culminating in a formal team-based design project presentation.

The primary deviation in the first-year curriculum is that in the second term Civil Engineering students take two program specific courses, “Earth Systems Science” (CIV185) and “Introduction to Civil Engineering” (CIV191), while the Lassonde Mineral Engineering students veer toward the program specific courses “Insight into Mineral Engineering” (MIN120) and “Introduction to Mineral Engineering” (MIN191).

Mutual Academic Activities

Within the engineering profession, civil and mineral engineers often rely on each other for their specialized expertise. Civil engineers cannot construct the underground infrastructure of a city without consulting the experts in underground space. Similarly, mineral engineers require experts in environmental engineering, structures, transportation and a variety of other civil engineering aspects in order to build the systems that provide us with mineral resources safely, sustainably, and economically. To assist in the development of a common knowledge base that will play into practice beyond their professional training, students in the Civil Engineering and the Lassonde Mineral Engineering programs share a number of mutual core course requirements over the second and third years of their programs.

In Year 2 of each program, all civil and mineral engineering students are required to take CME210: Solid Mechanics I, CME261 and CME262: Engineering Mathematics – Levels I and II, CME270: Fluid Mechanics, CME259: Technology in Society and the Biosphere I, and CME263: Probability Theory for Civil and Mineral Engineers. In Year 3, students correspondingly take CME321: Geotechnical Engineering I, CME358: Survey CAMP (Civil and Mineral Practicals), and CME368: Engineering Economics and Decision Making.

Comparable Academic Activities

Similar in structure but unique in content is a course offered in second-year of both programs, intended to provide Civil and Lassonde Mineral Engineering students with opportunity to gain hands-on insight into the inner workings of their respective professions, and to observe demonstrations of the application of concepts central to their chosen field.

For Civil engineering students, the course CIV201: Introduction to Civil Engineering involves embarking on a series of structured thematic tours, both throughout the city and to key large-scale engineering facilities at remote sites. The tour component culminates in an overnight stay at Gull Lake Camp in Minden, Ontario. Students are instructed to record their experiences and observations in a field book, which is graded immediately following the course by the assigned teaching assistants. The student's report is then formally summarized through a partner communications component, CIV282: Engineering Communications I.

Previously, Lassonde Mineral Engineering students shared a similar type of experience via the second- year course, MIN225: Introduction to the Resource Industries. However, this course was discontinued following the 2019-20 academic cycle, with some course components migrated to the first-year introductory course MIN120: Insight into Mineral Engineering, commencing in the 2020-21 academic cycle. Upon review the Department assessed that this approach was not providing students with adequate scope and opportunity for first-hand observation to achieve the desired result within an experiential learning context. Therefore, commencing in September, 2023 the course MIN201: Mineral Engineering Field Excursion will be incorporated into the second-year LME curriculum. This course will consist of site visits to observe the three key components of the mining process: an open pit, an underground mining operation, and a mineral processing plant. The tour will involve an overnight stay in a locale situated near the host mining operation (such as Timmins, Ontario) and, as with CIV201, the LME students will be required to complete and submit a comprehensive field notebook for assessment.

These site-based experiences not only make for a dynamic, interactive program start for our undergraduate students, but also serve as useful vehicles for students to establish meaningful bonds with their peers, and thereby sets a tone for collegiality and team spirit that carries throughout the remaining years of their undergraduate program.

While students in both programs are required to pay an extra fee to cover part of the costs for meals and accommodations associated with these courses, LME students receive reimbursement for the fee through a bursary provided via a long-standing alumni donation.

In third-year, all Civil and Lassonde Mineral Engineering students participate in CME358: Survey CAMP (Civil and Mineral Practicals), an intensive two-week field-based session conducted at the University's Gull Lake Camp facility. Through this activity students gain hands-on experience in the use of the various field instruments commonly used by civil and mineral engineers, and carry out a series of exercises to reinforce their practice in surveying, topographic mapping, and environmental systems specific to water quality monitoring and assessment. The environmental component culminates in completion of a phosphorus balance for Gull Lake and identification of sources of phosphorus from the Camp.

The Survey CAMP experience itself also contributes to the added-value aspects of team-building, peer support, and collegial cooperation introduced in CIV201 and MIN201. In conversations with our alumni over the years we have observed that it is the Survey CAMP experience that resonates most often with them, and this has been substantiated through the generous donations our alumni have made in support of Survey CAMP[2].

In fourth-year, Civil Engineering students participate in CIV498: Capstone Design Project, a team-based design experience which integrates concepts from mathematics, basic sciences, engineering sciences, aspects of complementary studies, and detailed design aspects of various civil engineering sub-disciplines. The Department also competitively selects and sponsors a CIV498: Capstone Design Project team to represent U of T Engineering at the Canadian Society for Civil Engineering's annual CSCE National Student Capstone Design competition. However, Civil Engineering students interested in engaging in a more multi-disciplinary capstone experience also have the option of exchanging CIV498 with APS490Y:1 – Multi-Disciplinary Capstone Design.

Correspondingly, fourth-year students in the Lassonde Mineral Engineering program participate in MIN466: Mineral Project Design and MIN467: Mineral Project Design II, a sequential two-part capstone course that draws upon all aspects of practice introduced and developed throughout the earlier stages of their undergraduate program. In this instance, students are given a data set from a potential mine site and are challenged to undertake an extensive pre-feasibility design to determine if development of a mine at the candidate site would be technical, economically and environmentally feasible. Particular emphasis is placed on communications, most specifically on the technical aspects incumbent in the preparation and writing of technical reports, and presentation skills.

To complement the MIN466/MIN467 capstone course, Lassonde Mineral Engineering students also engage in MIN400H1: Geology Field Camp for Engineers, which is taken just before the Fall session of fourth-year. Here students learn to identify rock types in the field, incorporate geological observations into their engineering data sets, and map geological structures related to mineralization of potential economic importance. The course is taught in the Sudbury region of Ontario where there are several operating mines available for observation.

Complementary Studies/Humanities and Social Sciences Electives

All FASE undergraduate students are required to complete up to four half-course credits in courses identified as "Complementary Studies/Humanities and Social Sciences" (CS/HSS) electives at some point during their program. These courses are broadly defined as studies in humanities, social sciences, arts, management, engineering economics and communication, and are intended to complement the technical content in the undergraduate curricula. Complementary studies are considered to be essential in the education of an engineer, namely with regard to the following key elements:

- introduction to the methodologies and thought process of the humanities and social sciences
- basic knowledge of engineering economics
- competence in oral and written communications
- awareness of the impact of technology on society

2 Commentary on alumni support for the Survey CAMP Gull Lake facility is outlined within the Resources & Infrastructure section of this report.

Although most of these elements are incorporated into the courses offered through the prescribed curricula of our undergraduate programs, our Civ and LME undergraduate students are nonetheless required to achieve the requisite CS/HSS credits specified by the Faculty/University. However, in our case we specify that at least two of these electives must be selected from among the list of approved Humanities and Social Science (HSS) courses.

Students may take these courses as suits their schedule, so long as the student is maintaining the minimum required course load throughout the academic year (September-April.) In consideration of overall course-load in second year and the Fall term of third year, we recommend that both the Civil Engineering and the Lassonde Mineral Engineering students elect to take three of these courses between the Winter term of third year and the Fall and Winter terms of fourth year. However, students also have the option of taking some of these electives during the summer terms as well.

Depending on the courses on offer in a given academic cycle, the list of approved CS/HSS course offerings does change from year to year. As such, the list of CS/HSS course offerings available in the current academic year is only available through the (Undergraduate) Engineering Portal managed by the Registrar's Office.

A copy of the 2022-23 curriculum for each program can be found in Appendix B.1 and Appendix B.2, or can be viewed on the Faculty Registrar's website at Civil Engineering | Faculty of Applied Science and Engineering (utoronto.ca) and Mineral Engineering | Faculty of Applied Science and Engineering (utoronto.ca) . As a point of clarification, Civil Engineering courses are identified by the code "CIV###", Lassonde Mineral Engineering courses are identified by the code "MINXXX" and shared courses are identified by the code "CME###".

Opportunities for Student Research Experience

As stated earlier, students in both the Civil Engineering and the Lassonde Mineral Engineering programs participate in a required fourth-year supervised design project, which provides opportunity for our senior undergraduates to engage in team research-based activities intended to challenge their shared knowledge and skills. In addition to this, students may also seek opportunities for a more individualized in-depth research experience through selection of CME499H or CME499Y: Individual Project.

The individual projects are arranged between the student and a supervising faculty member, and the project can have either a design or research focus. Design projects can be either motivated by the CIV498 Group Design Project and MIN466 Mineral Project Design experience, or can be entirely new. The student's work must culminate in a final design report or a thesis, as well as an oral presentation. The grading of both the final written submission as well as the oral presentation is carried out by the supervising faculty member. The Individual Project may be undertaken only once, either in the Fall (F) or Winter (S) Session (0.5 weight), or as a full year (Y) course (1.0 weight).

Additionally, all of our undergraduate students have the opportunity to develop their research skills at any point within their program in conjunction with the various non-credit summer research opportunities offered through the Faculty and the University, such as the NSERC Undergraduate Student Research Awards (USRA) and the FASE Undergraduate Summer Research Fellowship programs.

In 2022 a total of 19 Civil and Mineral Engineering students participated in summer research opportunities. The following chart compares undergraduate student involvement in summer research across the Faculty in the past year, with CivMin student participation showing as comparable to other FASE departments of similar size.

Table 2.9 Undergraduate Participation in Summer Research Opportunities by Academic Area, 2022

Research Participation	U of T	Abroad	Total
ChemE	4	2	6
CivE and MinE	18	1	19
ECE	32	2	34
EngSci	86	8	94
MIE	40	4	44
MSE	16	1	17
Total	**196**	**18**	**214**

Note: Data source: "By the Numbers - Annual Report 2022", FASE. As of publication time, only partial data on summer research opportunities for ChemE students was available. Pandemic-related travel restrictions also limited participation in international summer research opportunities for 2021-2022.

Although participation in summer research opportunities across the Faculty was affected to some extent by disruptions associated with COVID-19, within the Department we were able to run the NSERC USRA program throughout the "pandemic years" quite successfully, even during the first year of disruptions in 2020 when students were required to participate solely via remote connection. Nevertheless, we do anticipate seeing an increase in participation over the coming years as recovery from pandemic-related disruptions continues to improve.

As a means of demonstrating the consistency of our student participation in summer research, below is a tabulation depicting CivMin student participation in the NSERC USRA program over the past six years.

Table 2.10 NSERC Undergraduate Summer Research Awards - Civil & Mineral Engineering Student Participation, 2018 to 2023

Year	CivMin Student Participation
2018	17
2019	15
2020	15*
2021	16
2022	15
2023	15

* Year program was run remotely

Examples of NSERC USRA funded projects underway during the current year include "Understanding and Reducing Urban Construction Material Use" under the supervision of Professor Shoshanna Saxe, "Cyanobacteria and Cyanotoxins in Drinking Water" supervised by Professor Ron Hofmann, and "Leak Rate Test of a Concrete Containment Structure" with Professor Oh-Sung Kwon supervising.

Additionally, many of our faculty members hire undergraduate students directly to work on projects within their labs exclusive of any competitive funded programs, and a good number of our undergraduate students, eager for exposure to the research environment, volunteer to work in a lab in order to gain and/or build on their applied research skills.

Opportunities for Student Learning Beyond the Program/Classroom

Minors/Certificate Programs

In addition to their primary program, Civil and Lassonde Mineral Engineering students may also elect to undertake one of the many engineering minors offered through the Faculty. The selection of minor programs available encompass a wide range of divergent professional practices, such as advanced manufacturing, artificial intelligence, bioengineering, engineering business, global leadership, nanoengineering, robotics and mechatronics, and sustainable energy. Students choosing to engage in a minor gain interdisciplinary experience and exposure to new concepts and perspectives, widening their understanding of both the engineering profession and the issues that impact engineers. These minors are usually completed within the same time frame as the BASc program and upon successful completion the minor is noted on the student's transcript

Table 2.11 below shows total undergraduate student participation in the various minor and certificate programs across the Faculty over the past five years, while Table 2.12 lists the select program options and participation rates specific to students in the Department of Civil & Mineral Engineering.

Table 2.11 All Engineering Students Completing Minor and Certificate Programs, 2017-18 to 2021-22

	Minor/Cert	Title - Short	2017–18	2018–19	2019–20	2020–21	2021-22	5-Year Total
Minor	AEMINADVM	Advanced Manufacturing	15	33	32	30	26	136
	AEMINAIEN	Artificial Intelligence Engineering		3	47	123	166	339
	AEMINBIO	Bioengineering	39	41	35	50	44	209
	AEMINBME	Biomedical Engineering	11	12	13	8	17	61
	AEMINBUS	Engineering Business	171	165	194	222	236	988
	AEMINENR	Sustainable Energy	75	45	40	41	54	255
	AEMINENV	Environmental Engineering	42	35	24	35	29	165
	AEMINNANO	Nanoengineering	4	5	3	1	5	18
	AEMINRAM	Robotics & Mechatronics	85	80	92	68	51	376
	AEMINMUSP	Music Performance			1		4	5
Minor Total			**442**	**419**	**481**	**578**	**632**	**2552**
Certificate	AECERAIEN	Artificial Intelligence Engineering		5	45	119	109	278
	AECERBUS	Engineering Business	192	231	249	220	216	1108
	AECERCOM	Communication		3	4	5	1	13
	AECERENTR	Entrepreneurship, Innovation & Small Bu	7	4	6	12	4	33
	AECERFORE	Forensic Engineering	11	9	9	20	25	74
	AECERGLOB	Global Engineering		2	2	8	3	15
	AECERLEAD	Engineering Leadership	9	12	9	19	32	81
	AECERMINR	Mineral Resources	1	1				2
	AECERMUST	Music Technology		2	3	5	1	11
	AECERNUC	Nuclear Engineering	4	3	6	3	3	19
	AECERRRE	Renewable Resources Engineering	3	8	3	3	3	20
Certificate Total			**227**	**280**	**336**	**414**	**397**	**1654**
Grand Total			**669**	**699**	**817**	**992**	**1029**	**4206**

Table 2.12 Civil & Mineral Engineering Students Completing Minor and Certificate Programs, 2017-18 to 2021-22

	Minor/Cert	Title - Short	2017–18	2018–19	2019–20	2020–21	2021-22	5-Year Total
Minor	AEMINAIEN	Artificial Intelligence Engineering					1	1
	AEMINBUS	Engineering Business	35	21	35	35	33	159
	AEMINENR	Sustainable Energy	2	3		4	7	16
	AEMINENV	Environmental Engineering	32	26	15	23	11	107
Minor Total			**69**	**50**	**50**	**62**	**52**	**283**
Certificate	AECERBUS	Engineering Business	16	24	29	16	14	99
	AECERENTR	Entrepreneurship, Innovation & Small Bu	2	1	1	2		6
	AECERFORE	Forensic Engineering				1	2	3
	AECERGLOB	Global Engineering				3	1	4
	AECERLEAD	Engineering Leadership		1		4	4	9
	AECERMUST	Music Technology		1				1
Certificate Total			**18**	**27**	**30**	**26**	**21**	**122**
Grand Total			**87**	**77**	**80**	**88**	**73**	**405**

While overall participation in the various undergraduate minor program offerings by our students is proportional within the Faculty, with a total of 405 Civil and Lassonde Mineral Engineering students graduating with an interdisciplinary minor or certificate program achievement notation on their transcripts over the five-year period. This represents approximately 11% of total participation in minor programs, and 7.4% of total participation in certificate programs.

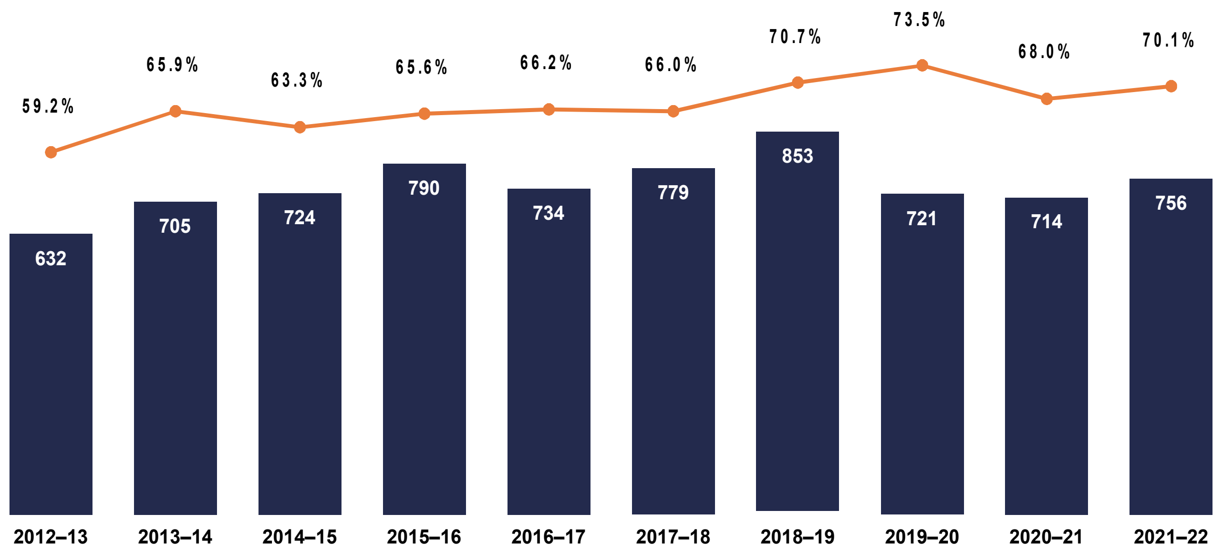
Irrespective of this, we do recognize that Lassonde Mineral Engineering student participation in these enrichment programs is curtailed, largely due to constraints imposed by course scheduling combined with limited opportunity for the LME students to inject elective courses into their program schedules. This issue has come to the fore during our examination of the LME curriculum, and is being addressed as a priority through our current curriculum review exercise.

Professional Experience Year

Over and above the more traditional forms of academic study, students in our Civil and Lassonde Mineral Engineering BASc programs are proactively involved in the additional value-added program enhancements available through the Faculty. Of particular note is the Professional Experience Year (PEY) program, in which students have opportunity to temporarily suspend their academic studies to undertake a 16-month work term assignment designed to facilitate development of their practical skills within a professional engineering setting. The PEY is usually undertaken between the student's third and fourth year of study.

In 2021-22 there was a total of 756 students across the Faculty participating in the PEY program (see Figure 2.6 below.) Of this, 66 Civil and four Lassonde Mineral Engineering students engaged in PEY placements representing approximately 9.2% of the Faculty total, or approximately 66% of Civil Engineering and 30% of Mineral Engineering students, out of our total third-year undergraduate population of 97 Civil and 12 Mineral students. We expect to see CivMin participation in the PEY program increase as the economy and business activities resume to normal.

Figure 2.6 Number of Engineering Undergraduate Students Participating in PEY Co-op with Percentage Participation, 2021-2023 to 2021-2022



Note: Percentage of participation is calculated by dividing the number of completed PEY Co-op positions by the number of eligible students (i.e., the third-year cohort from the previous year).

Student Involvement in Professional Affiliations

There are also a number of clubs and affiliated professional societies that Civil and Lassonde Mineral Engineering students participate in, for example the Canadian Society of Civil Engineers, the Ontario Water Works Association, Engineers in Action, ASHRAE, the Sustainable Engineers Association, Engineers Without Borders, Canadian Mining Games, and the Canadian Institute of Mining, Metallurgy and Petroleum. CivMin students also engage in a wide range of specialized design teams and external competitions supported through the student-run Engineering Society, more commonly known as Skule™. Links to the extra-curricular clubs and activities available to undergraduate students can be found at Skule - University of Toronto Engineering Society.

Assessment of Learning

There are several exercises and methodologies that help shape and contribute toward our ongoing assessment of the quality, rigour, appropriateness and effectiveness of our undergraduate programs. These include cyclical program reviews related to the preservation of our program accreditation status, departmental reviews as commissioned by the Faculty and the University, through development of departmental strategic and academic plans, and through faculty retreats and town hall meetings with our students.

In the first instance, all undergraduate engineering programs at U of T are cyclically reviewed and accredited through the Canadian Engineering Accreditation Board (CEAB). These requisite reviews provide opportunity for in-depth analysis of our undergraduate programs and courses, and serve as an impetus for curriculum revitalization.

During our last accreditation review in 2018, both the Civil BASc and the LME BASc received approval for a full six-year accreditation. Each of these programs was originally scheduled to undergo their next accreditation review in June, 2025 but this has since been extended to June, 2026 in consideration of pandemic related setbacks.

The CEAB review process includes a component for examination of “Graduate Attributes”, a series of learning objectives or outcomes that define the qualities and skills graduating students should possess by completion of their program. Thorough examination of the graduate attributes assists us in ensuring that there are strong connections between program components and learning objectives, good links between courses, and that the CIV and LME programs have an appropriate balance of required and elective elements. However, while the CEAB has specified the characteristics of the graduate attributes in generic terms, responsibility for identifying the unique corresponding curricular indicators or quality measures rests with the school and department offering the program. The CEAB graduate attributes are analogous to the UTQAP/FASE degree level expectations (DLEs), so a successful accreditation review ensures that our undergraduate programs also meet the UTQAP/FASE DLEs.

The FASE’s undergraduate degree level expectations describe competencies, knowledge and skills expected of students graduating from our undergraduate programs. The Civil Engineering and Mineral Engineering department identifies the appropriate graduate attributes associated with each course through the consultative development of a curriculum map (respective to each undergraduate program offered), which connects course components to key attributes. The DLEs are regularly assessed by our Undergraduate Studies Committee. Our department was the first to engage in this approach to institutional curriculum review with the University and if proven successful our approach may also serve as a template or guideline for use in the curriculum review of other programs offered at the University. Further detail regarding this review process follows.

An outline of the generic definitions of the CEAB graduate attributes is attached in Appendix B.3. The following lists the Faculty’s undergraduate DLEs and the corresponding CEAB graduate attributes that apply.

Undergraduate Degree Level Expectations/Graduate Attributes

Depth and Breadth of Knowledge: This is related to the Graduate Attribute (GA) “**knowledge base for engineering**”, which requires “Demonstrated competence in university-level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.” This is assessed across the curricula of the Civil and Lassonde Mineral engineering programs.

Knowledge of Methodologies: This is related to the GA “**problem analysis**” which requires “An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.” This UDLE/GA is introduced in first year (CIV100), developed in second year (e.g. in Solid Mechanics I, Engineering Mathematics I, and Structural Analysis I) and applied in third and fourth year (e.g. in Geotechnical Engineering II, Sustainable Energy Systems, Group Design Project).

Application of Knowledge: This is related to the GA “**design**” that requires “An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.” Design is introduced in first year, developed in third year, and applied in the fourth year Group Design Project (for Civil) and Mineral Project Design I and II (for Mineral).

Communication Skills: This is directly related to the GA “**communication skills**” and requires “An ability to communicate complex engineering concepts within the profession and with society at large”. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.” Communication skills are introduced in first year (Engineering Strategies and Practice I), developed in first and second years (Engineering Strategies and Practice I, Engineering Communications I, Civil Engineering Graphics), and applied in a number of third and fourth- year courses including Civil Engineering Communication Portfolio, Survey Camp, Engineering Economics and Decision Making, Mineral Reserve and Mineral Resource Estimation, Mineral Economics, and the Group Design Project.

Awareness of Limits of Knowledge: This is related to the GA “**lifelong learning**”, and requires “An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.” This is introduced in first year in “Engineering Strategies and Practice I and II", developed in "Introduction to Civil Engineering", and developed in third year in Survey CAMP.

Autonomy and Professional Capacity: This is related to several GAs, including "**professionalism**", "**impact of engineering on society and the environment**", "**ethics and equity**", and "**economics and project management**". The introduction occurs in first year in Engineering Strategies and Practice I and II and is developed in a number of second and third-year courses.

Quantitative Reasoning: This is related to the GAs "**investigation**" and "**problem analysis**", and met by the numerous lab experiments conducted by students in courses. The investigation GA is introduced in first year in Engineering Strategies and Practice I, developed in Engineering Strategies and Practice II, Introduction to Civil Engineering, Urban Engineering Ecology, Mineral Economics, and applied in Survey Camp and Mineral Project Design I and II.

Information Literacy: The Faculty requires all students to develop an advanced understanding of how to obtain, manipulate and evaluate information; how to bring diverse sources together to develop a comprehensive understanding of specific issues, and how to solve problems or apply the scientific method to create further knowledge in the discipline. This is met by many aspects of the Civil and Mineral curricula, but particularly emphasized in the 400- and 500-level courses and the fourth-year design projects.

Curriculum Review

Through surveys and town hall discussions conducted during the Department's 2018 UTQAP review, participating students helped us to identify a widely-shared desire to place emphasis on optimizing course offerings, and to explore areas where we might be able to amalgamate courses in order to bring concepts closer together. There was also strong support for the Department to endeavour to open up room within the curriculum to allow greater opportunity for students to incorporate technical electives at an earlier stage within their program. This resulted in a recommendation (Rec. #5) that, as part of a strategic plan, the Department conduct a curriculum review to identify curricular overlap and to address student workload.

The Department took this recommendation to heart and determined that, as a first step, the curriculum would be reviewed in conjunction with preparations for the forthcoming 2025/26 CEAB review. Through this process, the Department identified a set of immediate-term (within six months), mid-term (within one to two years) and long-term goals (within three to five years.)

This provided a meaningful basis for commencing our course of action towards a comprehensive review process that has allowed for a more individualized analysis of the curriculum, based on our distinct student expectations and academic principles. The curriculum review is being led by the Department's Undergraduate Studies Committee (USC), and facilitated by Jessie Richards, Curriculum Development Specialist, Office of the Vice-President and Provost.

Since then we have been diligently following the path toward meeting our curriculum review objectives, although progress to completion had been slightly altered due to operational disruptions and setbacks resulting from the COVID pandemic. We are presently in the process of addressing the mid-term goals, which seek to identify curricular overlap and student workload issues, identify new opportunities and directions in the relevant professions, and complete the curriculum review and pass notable changes arising from the process through FASE's governance process. To date we have examined the content of all core courses in second and third years of both undergraduate programs, first by conducting a survey issued to all students and faculty. The intent of the survey was to identify and corral the courses offered by each faculty member, with a view to assessing our program learning objectives, and to begin the process for identifying overriding areas of alignment and potential cross-over.

Following this, we engaged in a "course share" process, which all departmental faculty members participated in. The course share sessions were conducted on-line via a series of ZOOM/Teams meetings, with each meeting dedicated to examining courses offered within a specific program year and semester. All relevant course instructors were requested to make a short presentation to the USC and instructors of courses of the same year, providing an overview of their course(s), with focus placed on discussion of the key topics covered in the course, and demonstrating the various linkages to other courses. This included courses that provided needed background to facilitate their courses, as well as courses that might potentially rely on material covered through their course. These course share sessions fed into the next stage of the review process: remapping the curriculum. This stage of the review is being developed solely by the members of the Undergraduate Studies Committee (USC). The following is a brief synopsis of the process to date.

From the outset the USC determined that they would not allow their approach to curriculum review to be constrained either by the CEAB process or its program requirements, although it was initially thought that the curriculum map utilized in the CEAB review process could serve as a starting point for assessing the learning outcomes for each course. However, in retrospect, the USC found that the CEAB version of the curriculum map was not entirely informative, as it did not clearly identify knowledge linkages between courses or, conversely, identify knowledge gaps. In addition, the USC determined that the CEAB approach to curriculum mapping could not be used as a quantitative substitute for true curriculum review, as CEAB must apply evaluation tools to a generalized audience applicable to all engineering programs offered nationally and, to the largest extent, is currently focused on pairing this to their defined graduate attributes. As such, the committee realized that they needed to redirect.

After exploring for examples of existing approaches to curriculum mapping, both within the University and at other institutions, none were found that would adequately articulate the USC's express goal to generate a meaningful assessment and representation of the Department's undergraduate curricula that would more accurately reflect knowledge sequencing, workload distribution and learning outcomes of our courses. It was then understood that, in order to achieve this the USC would need to be the generators for defining and developing a new curriculum mapping tool.

Presently, the committee is testing the use of data dashboards, digital analytic tools, and other business intelligence platforms (such as Power BI) to develop a mechanism for visualizing the undergraduate curricula. Eventually this will be used as an interactive tool to aid our students in understanding their educational trajectory, and to help guide them in their elective course selections. The articulation of the curriculum will be aligned to the University and Faculty's degree level expectations.

We expect our analysis of the undergraduate curricula to be completed during the 2023-24 academic cycle, with course changes, additions and deletions passing through the Faculty's governance process throughout the year and in time to be able to roll out our revised curricula in the 2024-25 cycle. The final stage will involve assessment of the effectiveness of enacted curriculum revisions over the ensuing five-year period, and perfecting development of the on-line tool.

In the interim, we have been continuing our ongoing practice of introducing new courses, and discontinuing outdated courses, as appropriate. Since our last review in 2018, the Department has added the following courses to the undergraduate curricula:

CIV191:	Introduction to Civil Engineering (2019)
CIV501:	Building Energy Performance Simulation (2022)
CIV578:	Design of Building Enclosures (2018)
MIN191:	Introduction to Mineral Engineering (2019)
MIN120:	Insight into Mineral Engineering (2020)
MIN520:	Mine Optimization (2022)
CME295:	Technology in Society and the Biosphere I (2021)
CME500:	Fundamentals of Acid Rock Drainage (2018)
CME538:	Introduction to Data Science for Civil and Mineral Engineers (2021)

And, as previously mentioned, we will be launching one new mineral engineering course in the coming academic year, MIN201: Mineral Engineering Field Excursion.

Undergraduate Student Satisfaction

Student satisfaction in their learning experience can be quantified from results arising through annual course evaluations conducted over all levels of our undergraduate programs. The set of charts below are predicated on a scale of 0 to 5 (Figures 2.7, 2.8, 2.9, 2.10 and 2.11) and correspond to the specific metric assessing student opinion regarding the quality of their overall learning experience over the five most recent semesters, and demonstrates that the general view of Civil and Mineral undergraduate students remains unchanged across all program years, hovering between "Satisfied" and "Very Satisfied", consistent with the viewpoint of students across all departments of the Faculty. We note that the dip seen in Level 3 is relational to the perceived compression of workload experienced in that program year, and we are addressing this through our ongoing curriculum review exercise.

Figure 2.7 Undergraduate Course Evaluation Summary, Winter term 2020

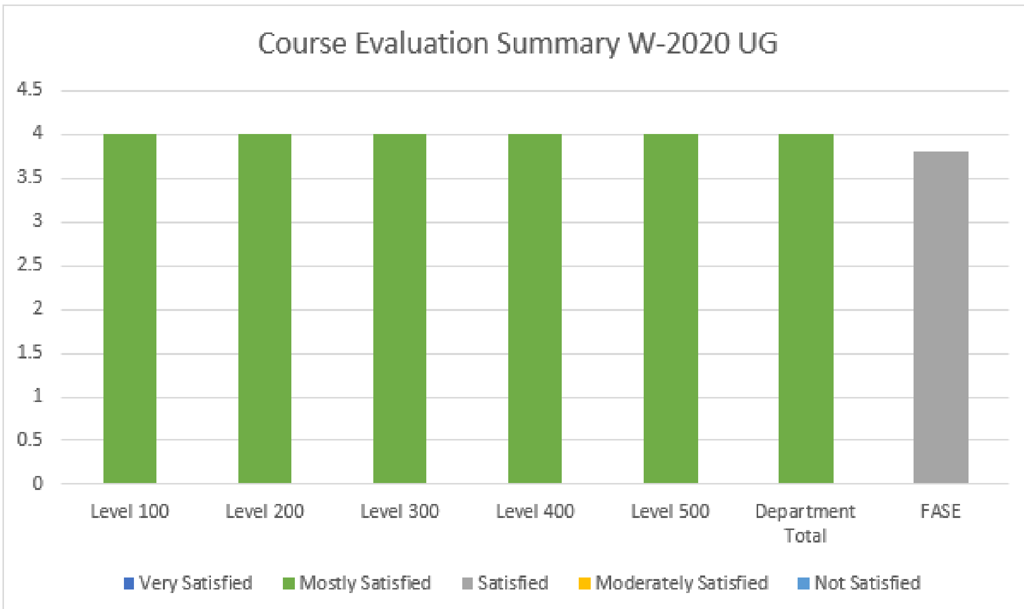


Figure 2.8 Undergraduate Course Evaluation Summary, Fall term 2020

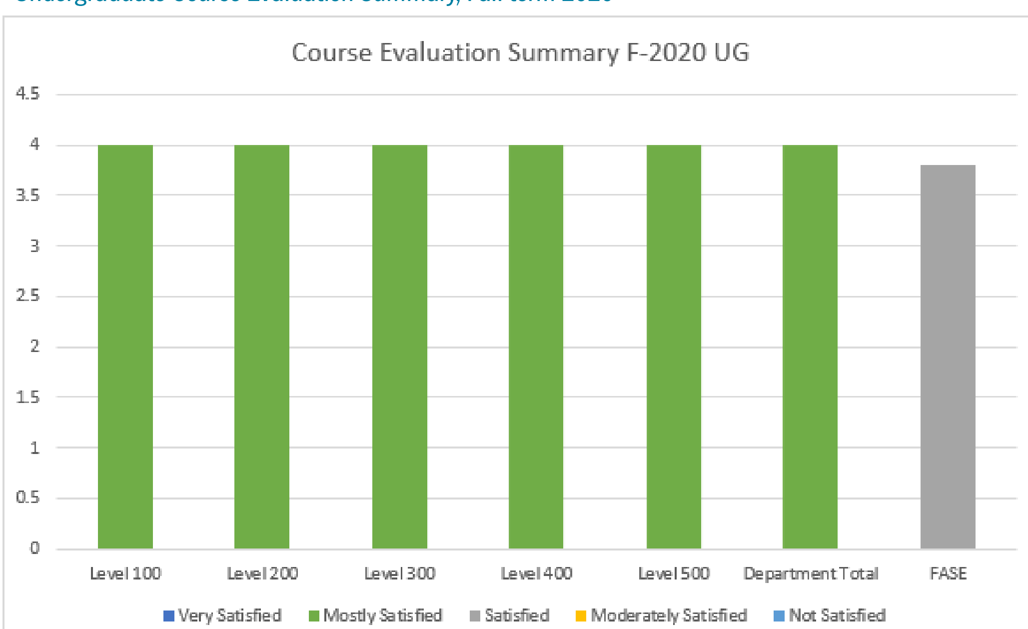


Figure 2.9 Undergraduate Course Evaluation Summary, Winter term 2021

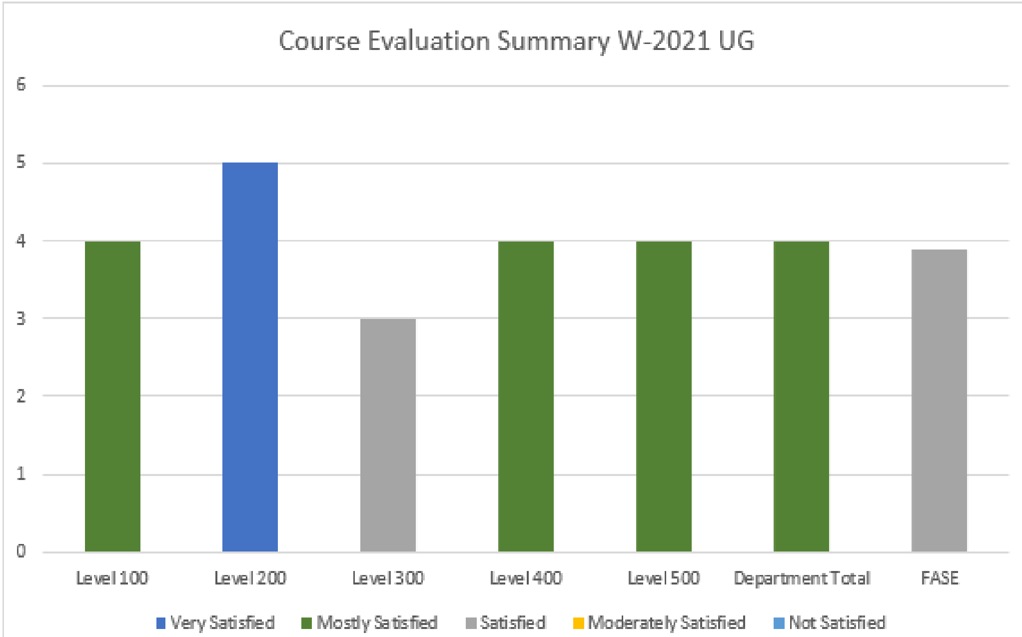


Figure 2.10 Undergraduate Course Evaluation Summary, Fall term 2021

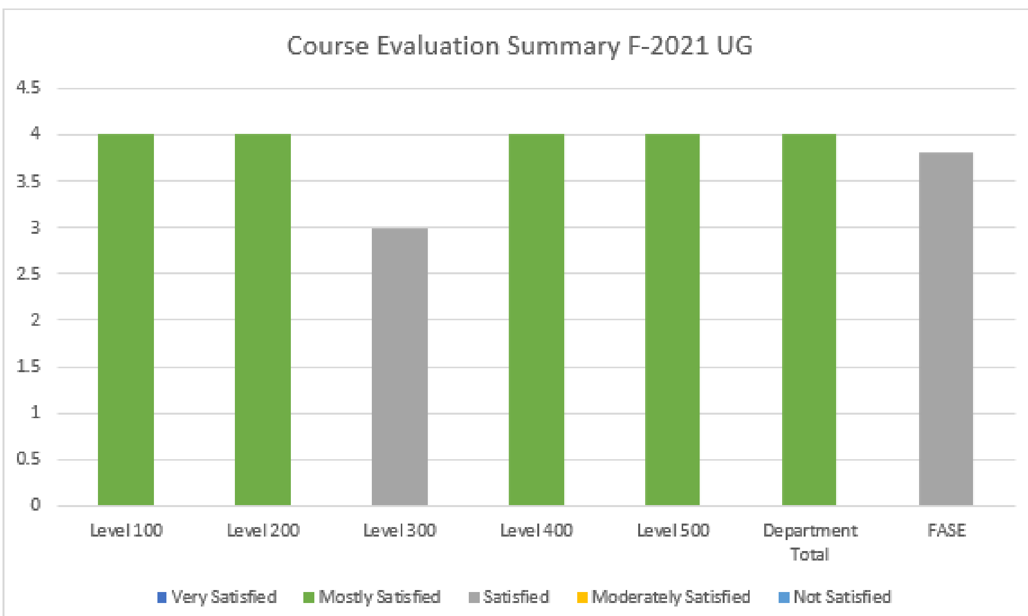
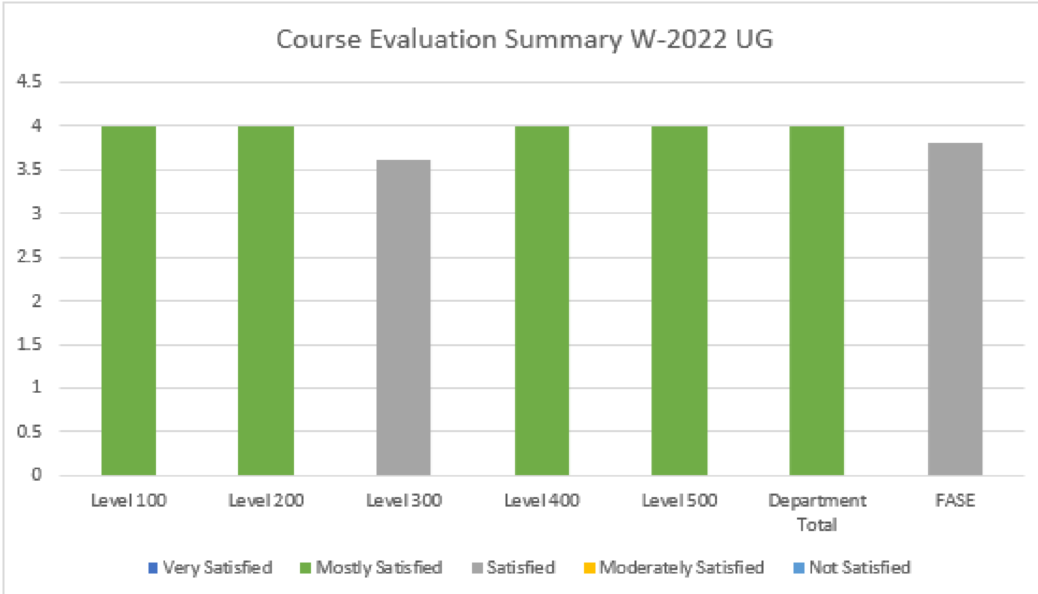


Figure 2.11 Undergraduate Course Evaluation Summary, Winter term 2022



Additional data tabulating Civil and Mineral undergraduate student satisfaction, as compiled through the triannual National Survey of Student Engagement (NSSE), demonstrates very little deviation from that of the U15 comparators for the 10 key NSSE engagement indicators. The full NSSE report can be reviewed in appendix (App. B.4).

During our 2017 Self-study review, our undergraduate students expressed a desire for the Department to direct more attention toward enhancing our student support resources, in particular student meeting facilities, and to expand on access to in-house academic counselling services. They also compelled the Department to intensify its efforts to provide more opportunities for students to network and build relationships with industry partners and alumni, through the establishment of a series of networking events to bring students and alumni together on a more regular basis, and working with students and alumni to develop a formalized mentorship program.

In response to this, the Department developed the Undergraduate Information Hub to keep students apprised of important dates, networking opportunities, and events of interest taking place not only within the Department but also elsewhere on campus and in the city. Admittedly, extra-curricular activities and opportunities for networking were adversely affected during the "pandemic years", which has presented some challenges in encouraging the students, especially those who began their programs in 2020, to engage socially and we do recognize that it may take some time to rebuild "Skule Spirit". Be that as it may, the movement toward online or virtual gatherings has to some extent enhanced our ability to draw our students' attention to special events and lectures showcasing experts from cognate institutions worldwide.

To encourage and support CivMin student-led initiatives, the Department continues to uphold its long-standing practice of providing financial support to our undergraduate and graduate student clubs, on average in the range of $15,000 to $20,000 annually.

On campus, the Department hosts several events throughout the academic year to provide students with opportunity to network and engage with professionals working in the field. This includes our annual CivMin Career Fair in which industry partners participate to both promote their companies and enjoy one-on-one engagement with our students. The Career Fair is usually held in the early part of the winter term so that students progressing towards program completion can make timely contacts with potential employers. A copy of the list of industry partners who participated in our January, 2023 Career Fair is provided in appendix (App. B.5). In addition, our Civil Engineering Advisory Board organizes and participates in a career discussion panel that is a featured activity offered as a component of our CIV201 course each year.

Through our weekly newsletter, intranet information hubs, and electronic display bulletin boards the Department also widely advertises and encourages our students to participate in related activities offered by our professional agencies, institutional partners and student-led interest groups, such as the many networking opportunities organized throughout the year by the U of T Career Exploration and Education Centre, FASEs ILEAD program, or the twice annual career fairs sponsored through the Sustainable Engineers Association. Of special interest to our Lassonde Mineral Engineering students is the annual Prospectors & Developers Association of Canada convention, which also plays host to the “MiningNeedsYou” career fairs sponsored by the Mining Industry Human Resource Council.

The Department also sponsors a wide-range of special lectures through our Distinguished Lecture Series, featuring in-depth lectures by expert speakers from around the globe. Further, the Faculty (through the School of Cities) sponsors a robust series of informal lunchtime seminars organized under the auspices of the “Knowledge Café”. Several of our faculty members have been featured speakers in this series.

A sampling of the events organized and promoted through the Department over the past year can be viewed on our on-line events calendar at https://civmin.utoronto.ca/home/about-us/calendar/

In response to the students’ request for expanded access to academic counselling, shortly after our 2018 Self-study review we held a staff retreat with the members of our Student Services and External Relations team, with a view to examining the spectrum of duties and services provided through that office. This resulted in identifying an opportunity for internal reorganization, so that some of the most commonly shared duties among the team were reassigned to a redefined role of departmental assistant. This role is now tasked with facilitating the flow of in-person traffic, serving as the point of first contact for all visitors to that office, and for screening, responding to and/or forwarding student inquiries as appropriate. This has served to free up our more senior counselling staff, enabling them to dedicate more time and opportunity to one-on-one student counselling. We also created the new position of Graduate Programs Coordinator responsible for student advising specific to our Master of Engineering programs. Details regarding this position will be addressed in the Graduate section of this report. A copy of the summary of discussion from the staff retreat is attached in Appendix B.6.

Mentorship opportunities for students are most generally provided via the fourth year Capstone Design Project core course (CIV498) and CME499 Individual Project technical electives, in which students work in-depth with an assigned project supervisor(s). This can be a faculty member, an alumnus working in the profession, or both. The Professional Experience Year described earlier in this report also provides students with opportunities for mentorship via their employment supervisors.

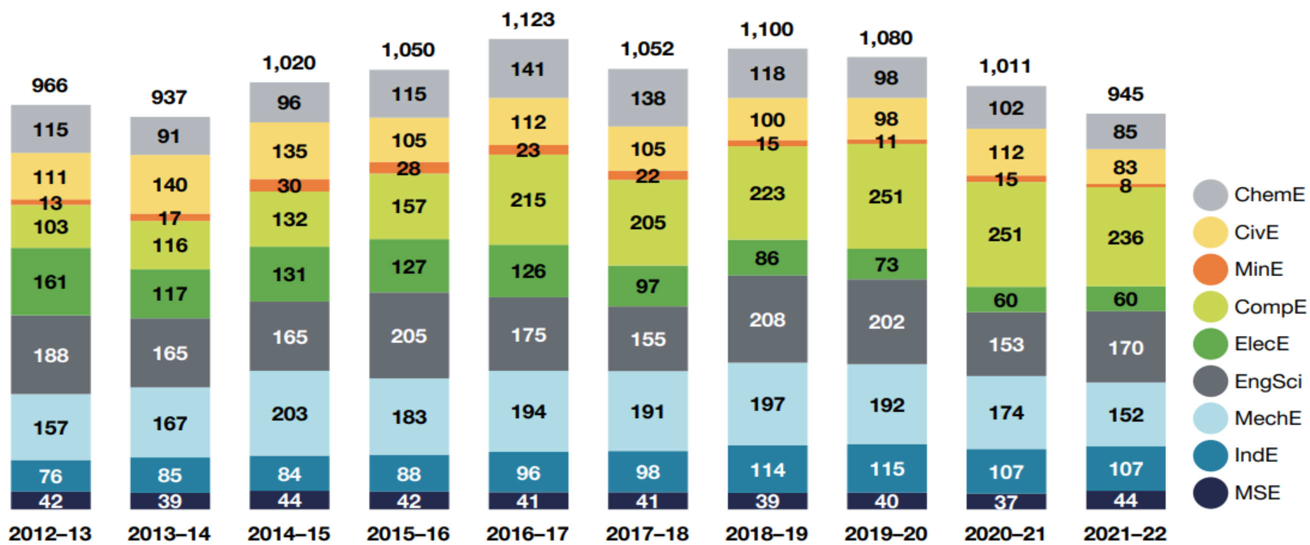
Space is an intractable and paramount concern for the Department, not only with respect to provision of student space but also with respect to research facilities, teaching resources and office space. This subject will be addressed in detail further in this report. However, with regard to responding to our undergraduate students’ request, the Civil Engineering students have a dedicated club space located in the Galbraith building, and the Lassonde Mineral Engineering students likewise have a dedicated club space located in the Lassonde Mining building. In addition, students may request assistance in booking one-time meeting facilities through our Infrastructure and Technical Services office. The Department also offers access to shared computing facilities to all undergraduate students. The Engineering Library located in the Sandford Fleming Building offers a number of carrels for student use. Further, the recently developed Myhal Centre for Engineering Innovation & Entrepreneurship offers a range of new facilities that students may access to work on projects, conduct student-led meetings, or simply to congregate socially.

Retention Rates and Graduation

Degrees Awarded

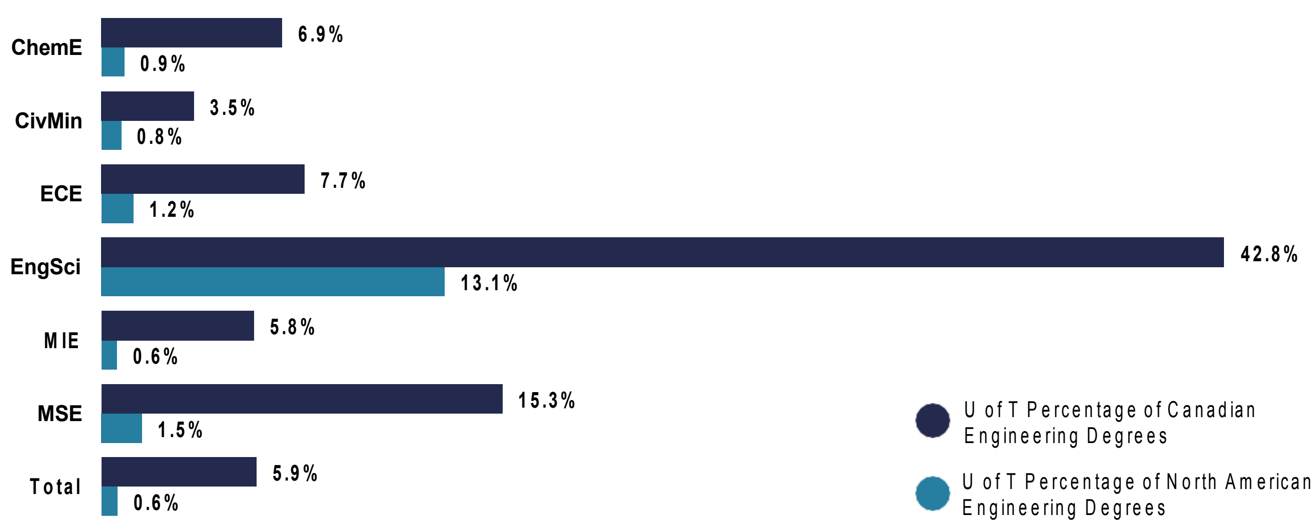
Figure 2.12 below depicts a comparison of the number of degrees awarded over the 10-year period 2012-13 to 2021-22, by department. While the data shows a decrease in both CIV and MIN program completions in the most recent academic cycle, with 83 Civil Engineering students and eight LME students successfully completing their program in 2021 (down from 111 and 13 in 2011 respectively) this is an across-the-Faculty trend which we believe may be related to a greater number of students choosing to defer graduation as a result of pandemic disruptions. As can be seen, the number of students graduating via the Civil and LME engineering programs has remained consistent over this period exclusive of the 2021-22 cycle.

Figure 2.12 Undergraduate Degree Awarded by Program, 2012-2013 to 2021-2022



In Figure 2.13 we see the number of CivMin degrees awarded in comparison to Canadian and North American degree totals. The comparison to Canadian degrees is down from 4.1% as reported in 2017 to 3.5% in 2020. However, the comparison to North American totals is static from 2017, resting at 0.8% in 2020. This is the trend across the Faculty, with the exception of Engineering Science which has increased year over year.

Figure 2.13 U of T Engineering Degrees Awarded by Academic Area Compared with Canadian and North American Degree Totals, 2020

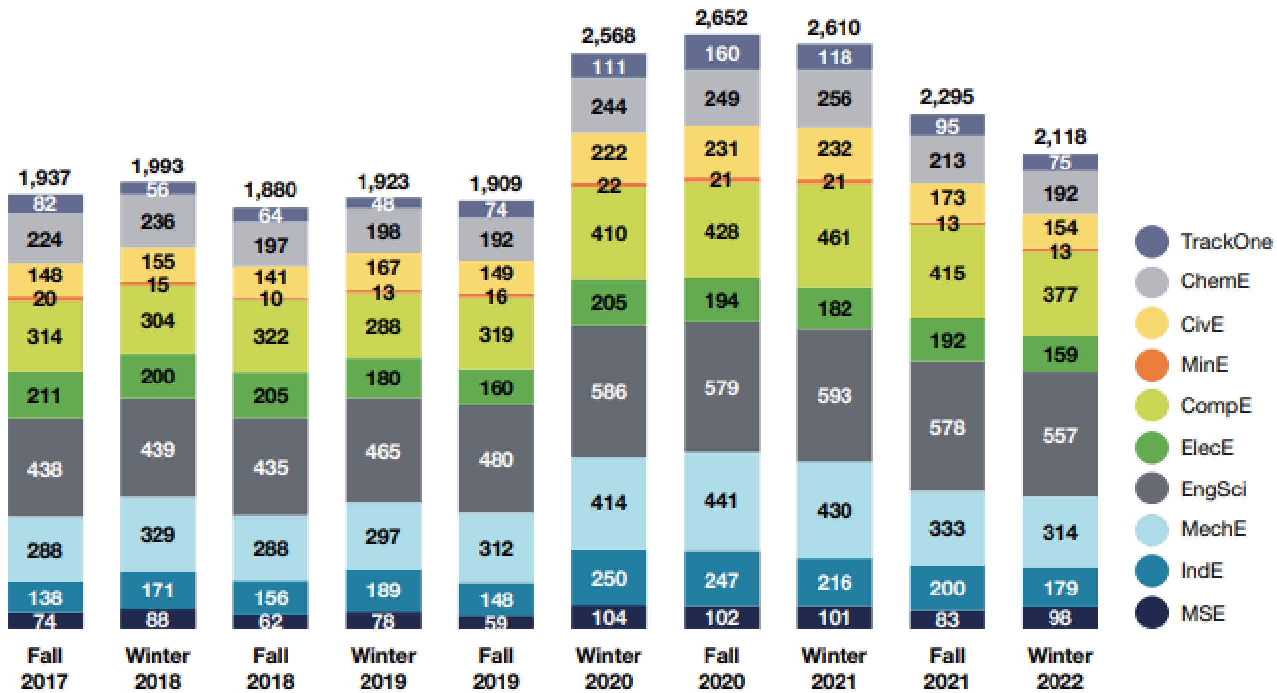


Note: Data sourced from reports produced by Engineers Canada and the American Society for Engineering Education; 2020 is the most recent year for which reports from both these institutions have been published. Total percentages show U of T as a proportion of all engineering degrees in North America, including those awarded in fields for which U of T does not have a specific degree program (e.g. Biomedical, Environmental, Software, etc.

Final Year Achievement

Although the overall number of students graduating with honours in 2022 was down significantly over previous years (Figure 2.14), this may also be indicative of impacts from pandemic disruptions (see footnotes). The accompanying chart (Figure 2.15) provides a breakout of Civil and Mineral Engineering students on the Dean's Honours list by year of study over the same time frame, while Figure 2.16 demonstrates that the overall final year achievement of CivMin students is comparable to the achievement level of students graduating from our cognate departments, with the GPA of students graduating from Civil Engineering averaging 76.2 per cent, Lassonde Mineral engineering students averaging 73.9 per cent, and the Faculty average resting at 77.8 per cent.

Figure 2.14 Number of Students on the Dean's Honour List by Term and Academic Area, Fall 2017 to Winter 2022



Note 1: Students are normally eligible to be considered for Honours standing only if they are carrying a full academic load (2.5 credits per session, excluding extra courses) and if the session is not being repeated. During fourth-year, a student may reduce their course load in either semester (but not both) and still be eligible for Honours standing, provided the other conditions are met.

Note 2: The results for 2020 Winter, 2020 Fall, and 2021 Winter reflect various impacts due to COVID-19 adaptations. Moving all classes to online formats necessitated adjustments both to specific assignments and to overall grading schemes. For 2020 Winter only, students were permitted to apply a Credit or No Credit (CR/NCR) option, rather than a percentage grade, to any of their courses, or even to drop a failed course, after seeing their final grades. Sessional grades used to determine honour status were calculated using only those courses that students chose to have recorded as a percentage grade. A minimum of 4 such percentage grades were required to be considered for the Dean's Honour List. For the 2020–2021 academic year, the CR/NCR option was discontinued, but the extended Late Withdrawal option was retained. Provision was also made for part-time students to achieve Dean's Honour List standing. For the 2021-2022 academic year the Late Withdrawal option was discontinued.

Figure 2.15 Civil and Mineral Engineering Students on the Dean's Honour List by Year of Study, 2017-18 to 2021-22

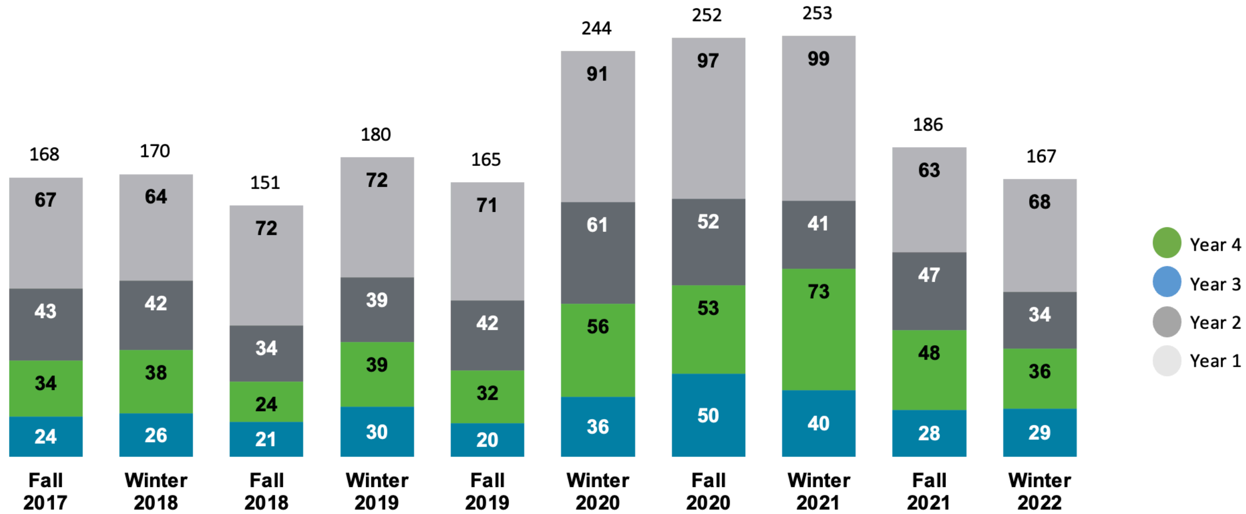
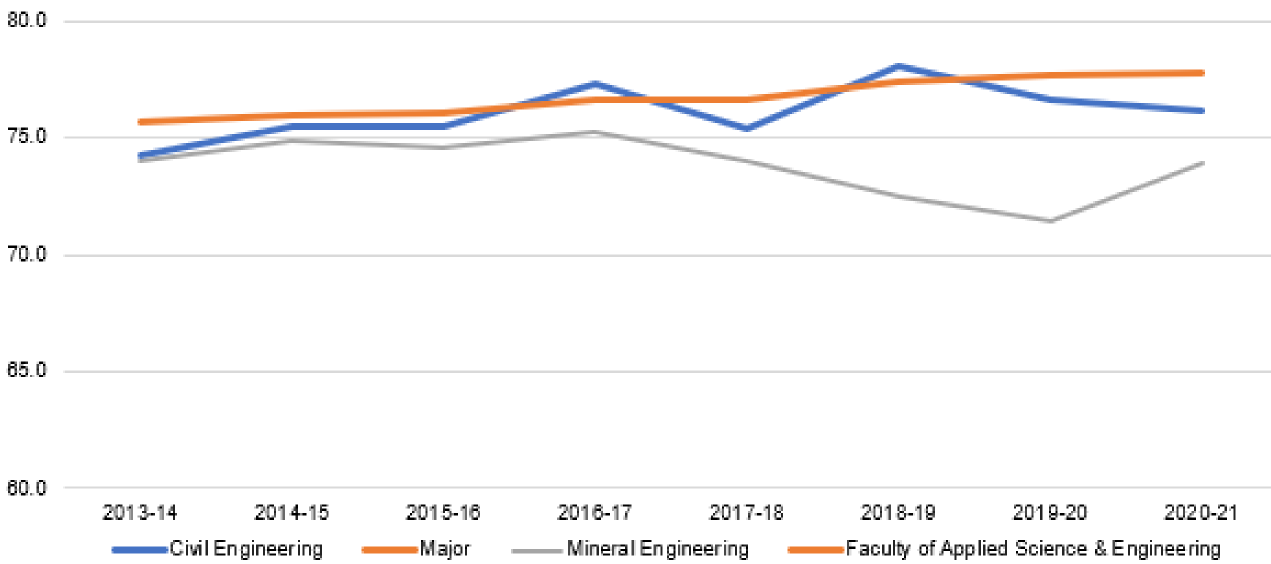


Figure 2.16 Department of Civil & Mineral Engineering by Program, Faculty of Applied Science & Engineering – Average Grades (in %) at Graduation



Note 1: The academic year consists of Fall, Winter, Summer terms. For example, the 2020-21 academic year consists of Fall 2020, Winter 2021 and Summer 2021 terms.

Note 2: Includes all courses taken by students in their fourth-year of study (year of study is independent of calendar year).

Note 3: In cases where students repeated a course or a year, the higher average is used.

2.3 Graduate Programs

2.3.1 Overview

The Department offers four distinct graduate programs which are generally defined as either research-based doctoral stream or professional development course-based programs of study. Doctoral stream programs include the Master of Applied Science, and the Doctor of Philosophy (MASc, PhD). Students accepted into the MASc and PhD programs are fully funded.

Professional stream programs are self-funded and include the Master of Engineering and the Master of Engineering in Cities Engineering and Management (MEng, MEngCEM).

The (minimum) admission requirements for all graduate programs is set in accordance with the standards set out by the University's School of Graduate Studies:

- an undergraduate degree, equivalent to a four-year University of Toronto program, with a minimum final year GPA of mid-B average (3.0/4.0 or 75%)

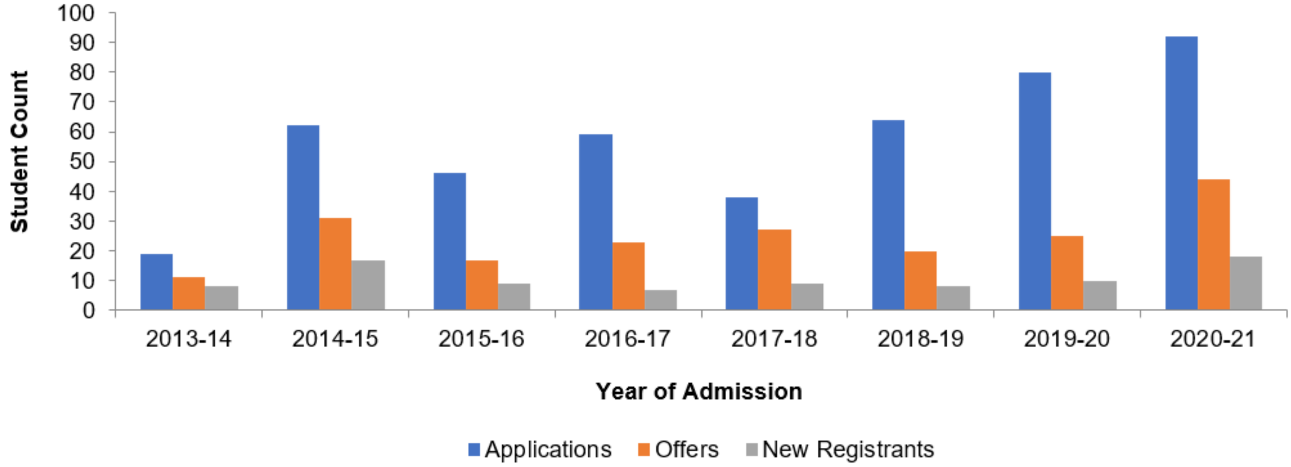
- proven ability to undertake studies in the English language as established either through completion of studies in a country where English is the official first language, or by way of submission of record of English proficiency as proven through any one of the universally recognized English tests, such as TOEFL, IELTS, MELAB, COPE or the Academic Preparation Course offered through the University's International ESL Program

- submission of a statement of interest, a copy of the applicant's curriculum vitae, a copy of the applicant's academic transcripts, and contact information for two referees

While the above denotes the minimum admission requirements as stipulated by the School of Graduate Studies, it is important to note that the quality of applicants compared to available spaces within a given graduate program generally exceed this minimum, with the majority of graduate applicants for doctoral-stream programs coming in with an A average, and generally at an A- average for MEng program applicants. As such, an offer of admission is predicated on a highly competitive applicant assessment, with differing parameters set according to the type of program. For example, assessment of applicants to the MEng programs may be more dependent on GPA as a primary measure, while applications to the MASc and PhD programs involve a broader assessment of the applicant's academic standing and prior experience within a research-based context.

In examining comparative data of applications, offers and corresponding registrations by program type, we can assess where our programs position within the Department, and which programs may require more proactive recruitment efforts. However, it is important to note that the Master of Engineering Cities Engineering & Management (MEngCEM) program is a specialized program, and as such new enrollments in the program are purposefully restricted to ensure and maintain quality. Additionally, new enrollments in our Master of Applied Science (MASc) and Doctor of Philosophy (PhD) program are equally driven by availability of funds of potential supervisors to support students.

Figure 2.17 Applications, Offers, Registrations - MEngCEM, 2013-14 to 2020-21



The MEngCEM program was launched in 2013-14 and since that time we have seen a steady climb in registrations, reaching 18 new students in 2020-21 and continuing on an upward trajectory toward our optimal enrollment of 25 new students each year.

In Figure 2.17 below, we see a fairly steady state with respect to the overall number of applications, offers and resulting registrations in our MEng program, fluctuating between 70 and 80 new enrollments each year. However, in the two most recent academic cycles (2019-20 and 2020-21) this had started to trend upward, resulting in 90+ new registrations each year. Although MEng enrolment is the primary revenue lever the Department has some control over, growth in the program does require some proactive attention to ensure that departmental resources can adequately respond to demand. Nevertheless, recently the Faculty as a whole assessed that MEng enrollments overall are in decline, such that there is now a shared mandate across the board to strategize and redouble our efforts to increase MEng enrollments over the next few academic cycles. In addition, departmental faculty are currently in the process of developing a new (online) MEng offering in mining, which we aim to have ready to receive applications for the 2024-25 academic cycle.

Figure 2.18 Applications, Offers, Registrations - MEng, 2013-14 to 2020-21

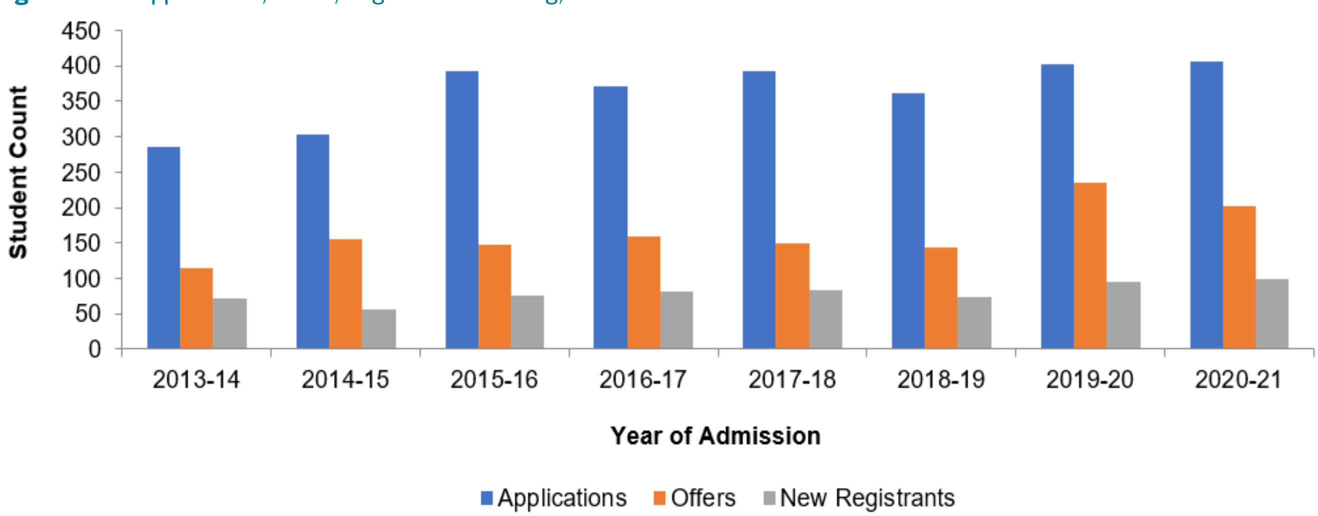
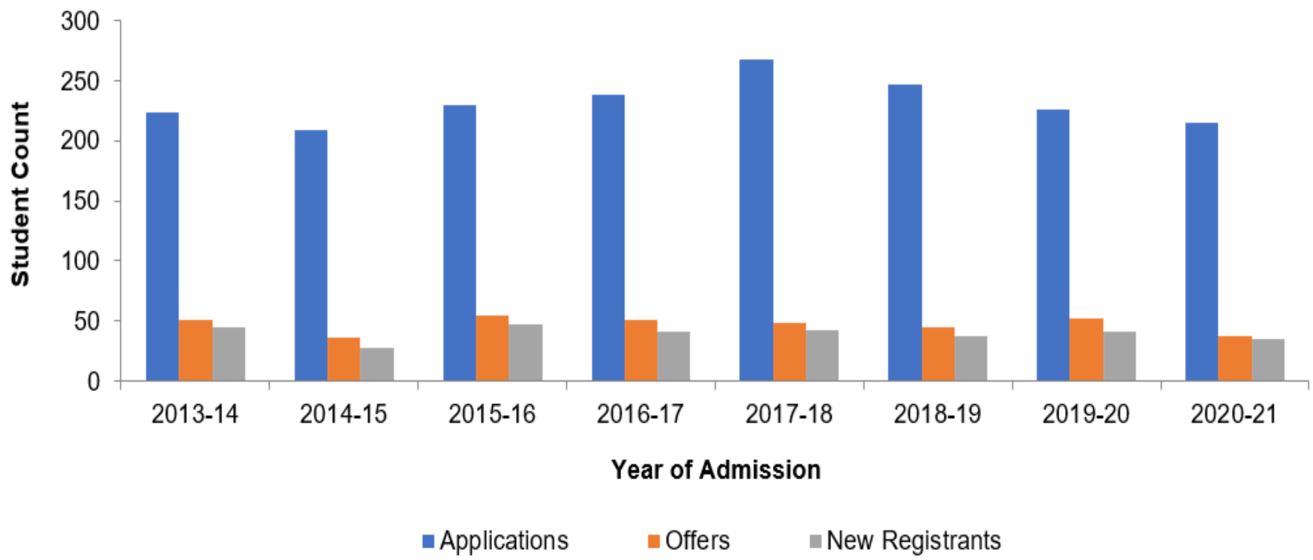
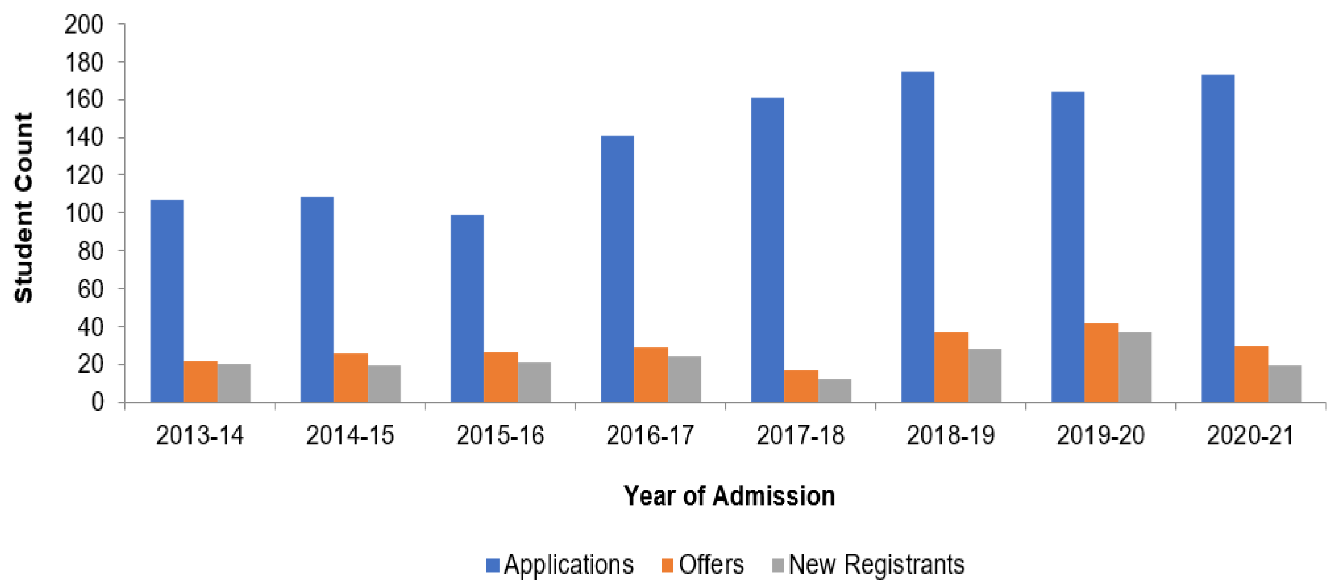


Figure 2.19 Applications, Offers, Registrations – MASc, 2013-14 to 2020-21



Applications to our MASc program range on average between 200-250 per admissions cycle, with approximately 50 offers being generated, and resulting in an average of 40 new registrations each year.

Figure 2.20 Applications, Offers, Registrations – PhD, 2013-14 to 2020-21



There has been a steady climb in applications to our PhD program, most notably from international applicants. Our capacity for generating offers has averaged at 30 per year, resulting in an equal number of new registrations. However, the 2020-21 admission cycle shows a slight decrease in PhD registrations, which again we view as being largely due to program deferrals of international students resulting from delays in obtaining visas and/or study permits brought about by COVID-19 disruptions.

Comparison of Graduate Program Acceptance - Civil & Mineral Engineering to FASE, Division III and U of T

Figures 2.20, 2.21 and 2.22 below demonstrate how registrations in our graduate programs align with the Faculty, the Physical Sciences Division and the University as a whole.

Figure 2.21 Acceptance Rates – Professional Master's Degrees, 2013-14 to 2020-21

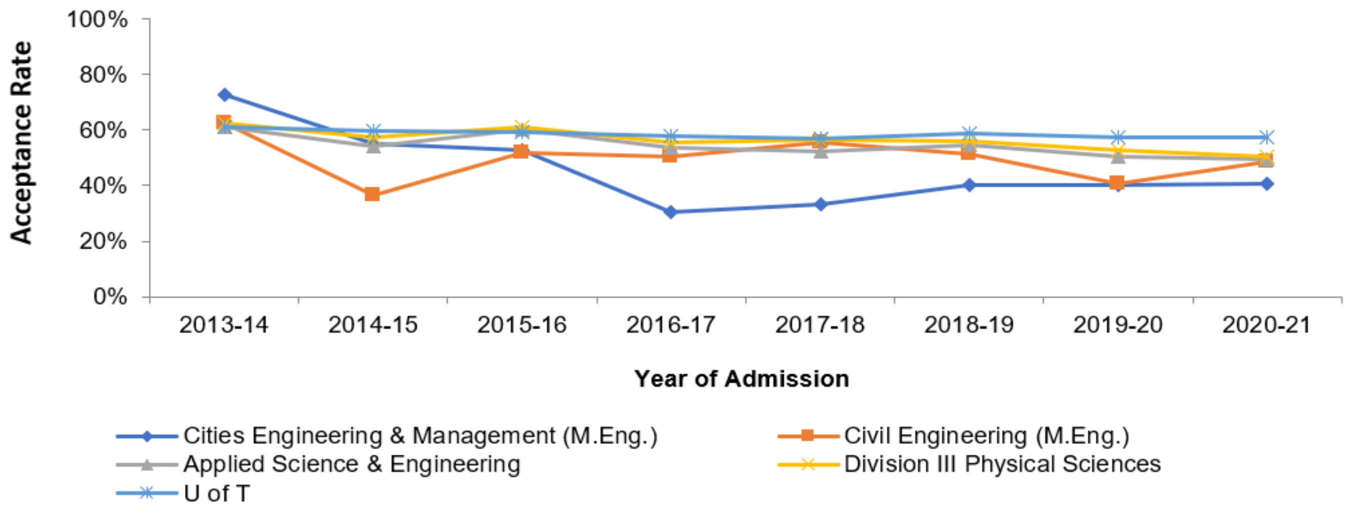


Figure 2.22 Acceptance Rates – Research Master's Degrees, 2013-14 to 2020-21

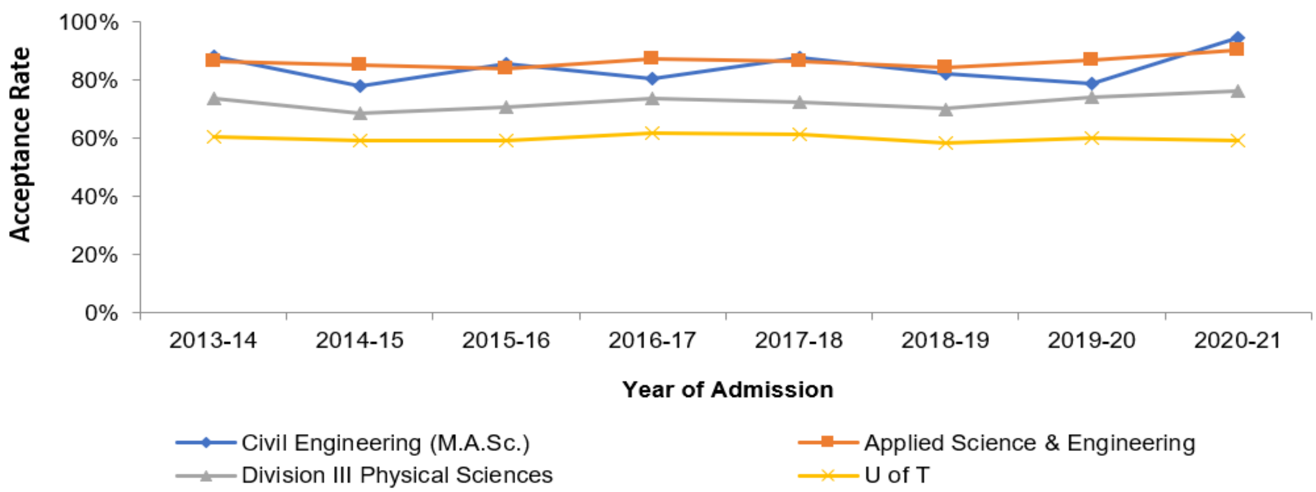
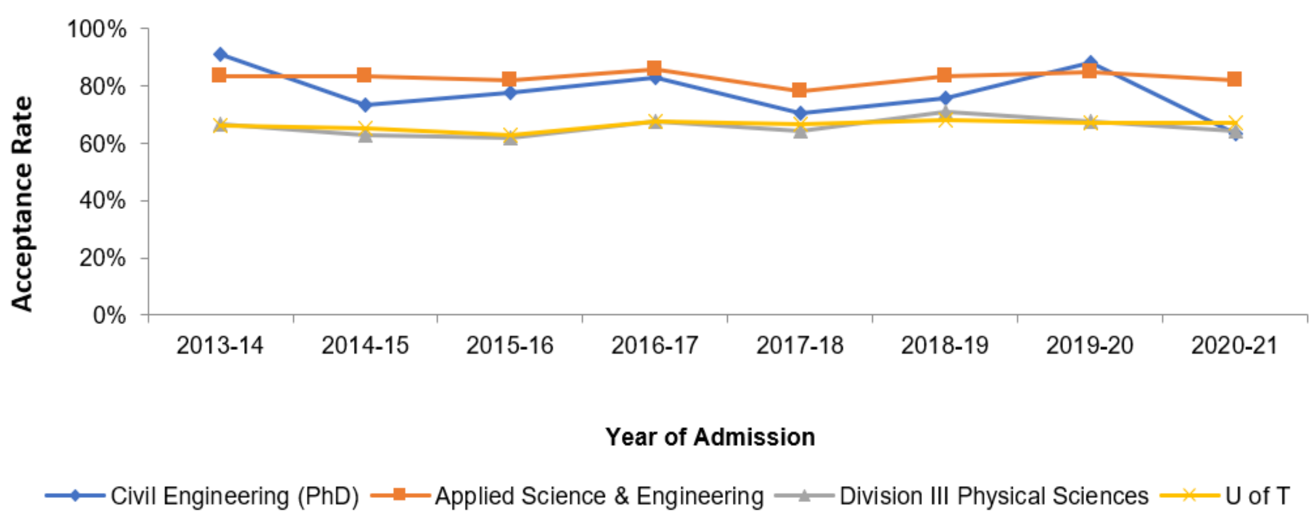


Figure 2.23 Acceptance Rates – Doctoral Degree, 2013-14 to 2020-21



All graduate program students may commence their program at the start of term in either September or the following January, although some doctoral stream students are now commencing their programs in May as well. The key commonalities for all graduate students in the Civil & Mineral Engineering Department are:

- all graduate students have license to self-select a program of study that best suits their academic objectives

- all graduate students must have their program of study pre-approved before undertaking their studies; in the case of doctoral stream students, MASc program plans are determined in consultation with and approved by the student's academic supervisor, but PhD program plans must be approved by the Department's Graduate Studies Committee. In the case of professional stream programs, approval is granted by either the Department's Associate Chair Graduate Studies, or for MEngCEM students the Director of the MEngCEM program.

There are myriad pathways a graduate student may choose to take in order to specify or enhance their program. For doctoral stream students this is achieved through focusing their studies within one of the Department's research themes: Cities & Infrastructure, Complex Systems, Energy & Environment, Mining & Subsurface Systems, Transformative Technologies, Building Engineering, Environmental Engineering, Mining & Geomechanics, Structural Engineering, or Transportation Engineering & Planning. Students may then further concentrate their studies through aligning their program with one of the associated sub-themes within a respective theme. For example, students selecting to study within the "Cities & Infrastructure" research area may refine this by concentrating their focus in one of the identified sub-themes of Aging Infrastructure, Air Quality, Structural Design, Building Science, Construction Management, Materials, Cost, Structures, Transportation, Underground in Cities, or Water. The professors who specialize within each of these areas are listed within the respective sub-theme. The grouping of the sub-themes serves to assist students in determining the appropriate academic supervisor(s) to guide them throughout their programs.

Doctoral stream students may also choose to undertake a specialized program emphasis in Sustainable Energy, or engage in a collaborative specialization in the areas of Engineering Education, Environmental Studies, or Psychology, Psychiatry and Engineering, via courses offered through several collaborating departments within the Faculty.

MEng and MEngCEM students also have broad scope for customizing their programs by selecting their courses from a wide range of program emphases encompassing the key areas of civil engineering practice: Building Science, Concrete, Construction Management, Environmental Engineering, Geomechanics, Structural Engineering Sustainable Urban Systems, Transportation Engineering and Planning. Each of the emphases offers a grouping of core and suggested elective courses most relevant to the specific emphasis. Successful completion of the specialization is denoted on the student's transcript.

Additionally, MEng students may also select to pursue one of the emphases offered through the Faculty: Advanced Water Technologies and Process Design, Analytics, Engineering Globalization, Entrepreneurship, Leadership, Innovation and Technology in Engineering (ELITE), Forensic Engineering, and Sustainable Energy. In some cases, a Faculty emphasis can be integrated into the student's base program, and in others the emphasis is considered an add-on to the student's base program. Students are limited to taking a maximum of two of the FASE program emphases, and in order to ensure that a manageable workload is maintained pursuit of these must be declared and approved by the Department's academic leadership. A complete listing of all of the MEng program emphases can be viewed on the Faculty website at: Professional Degree - Engineering Graduate Studies (utoronto.ca)

The fundamental distinctions of each program are detailed below.

2.3.2 Master of Engineering in Cities Engineering and Management (MEngCEM)

Over 50 per cent of the world's population live in cities, and according to the "World Development Indicators" report issued by the World Bank in June 2022, in Canada alone 81.6 per cent of our total population currently live in an urban area. It is projected that by 2050 at least 66 per cent of the world's population will be living in a major urban hub, and the number of megacities with 10 million or more inhabitants is also anticipated to increase from 33 in 2018 to 43 by 2030. Moreover, the majority of the global urban population is concentrated in Africa and Asia where impacts resulting from climate change are expanding and accelerating.

For this ongoing growth and extensive massing to take place constructively a cogent and practicable approach to civil engineering is vital, not only to improve efficiency and capitalize on infrastructure systems, but to do so astutely and in alignment with new building practices that are attuned to sustainability, and counteractive to the impacts of climate change. Highly-skilled professionals, armed with both technical expertise and a fundamental understanding of these global issues are needed to help our cities tackle these challenges and ensure the well-being of their inhabitants and economies.

Instituted in 2013, the Department's professional Master of Engineering in Cities Engineering and Management (MEngCEM) program was specifically designed to respond to these overlapping modern-day challenges. Through the MEngCEM program students gain a comprehensive understanding of the interaction between the systems and services of the city, improve their analytic skills in assessing the environmental, economic, political and social risks impacting civic policy making, and develop the skills and techniques required to address and solve these problems.

In addition to course-based study, MEngCEM students are required to complete a four-month internship within a relevant work environment, or carry out an in-depth research project working under the supervision of one of the Department's research faculty. In order to ensure that students are available to fully undertake the practicum component, registration in the MEngCEM program is only available on a full-time or extended full-time basis. The internship is generally undertaken during a summer session, and is usually conducted during the student's final year of study.

The requirements for achieving the MEngCEM designation are:

- successful completion of four core courses designed exclusively for the program in the areas of urban policy-making, data analytics (as specific to cities), infrastructure and urban prosperity, and examination of cities as complex systems

- successful completion of an additional three elective courses, selected from a range of eight specialization areas in the areas of Transportation Systems, Cyber Security, Urban Structures, Sustainable Energy Systems, Operations Research, Environmental Issues for Healthy Cities, resilience of Critical Infrastructure and Communication Networks

- successful completion of one additional course selected from among a list of courses grouped under the umbrella of "Technology Management Electives"

- successful completion of a four-month internship, or practicum

- as with all graduate programs offered through the Department, the MEngCEM student's proposed program of study must be approved by the Department's appointed program director.

2.3.3 Master of Engineering in Civil Engineering (MEng)

The Department's Master of Engineering program aims to provide graduate students with the tools necessary to succeed in professional practice. The program consists primarily of coursework, in which students must complete a selection of 10 half-credit equivalent graduate courses, with an option to undertake a one-term research project under the supervision of a CivMin faculty member. As mentioned earlier, students may also choose to customize their studies through aligning their program with one of the Department's defined program emphases.

Students have the option to complete their MEng program on a full-time, extended full-time or part-time basis. The distinction between the registration options is that extended full-time students are ostensibly considered to be full-time for FTE count, but they have the option to spread their programs out over a greater number of sessions than full-time, but not as many sessions as are allocated to part-time studies. There are also minor differences in the typical course load associated with each. The following chart lists the key differences between each of these registration options.

Full-time, Extended Full-time and Part-time registration options available to MEng students:

Full-time

- Typical program duration: 3 sessions (12 months)
- Typical course load: 4-5 half courses per term
- Total number of courses required: 5.0 full course equivalents (10 half courses)

Extended Full-time

- Typical program duration: 6 sessions (24 months)
- Typical course load: 2-3 half courses per term
- Total number of courses required: 5.0 full course equivalents (10 half courses)

Part-time

- Typical Program duration: 9 sessions (36 months)
- Typical course load: 1-2 half courses per term (maximum 2 courses per term)
- Total number of courses required: 5.0 full course equivalents (10 half courses)

The basic guidelines for structuring a qualitative MEng program of study are:

- successful completion of 10 graduate (i.e., 500 and 1000 level) half-credit (.5 HCE) courses
- six of the 10 courses must be offered through the CivMin department (CIV, MIN or CME course codes)
- one or two of the six courses may be a one term (CIV1001H) or two term (CIV1002Y) project that is undertaken within the student's selected emphasis area
- students choosing to undertake a one-term project via the Faculty's APS1001- Project Management course may also count this credit as one of the required six CivMin courses

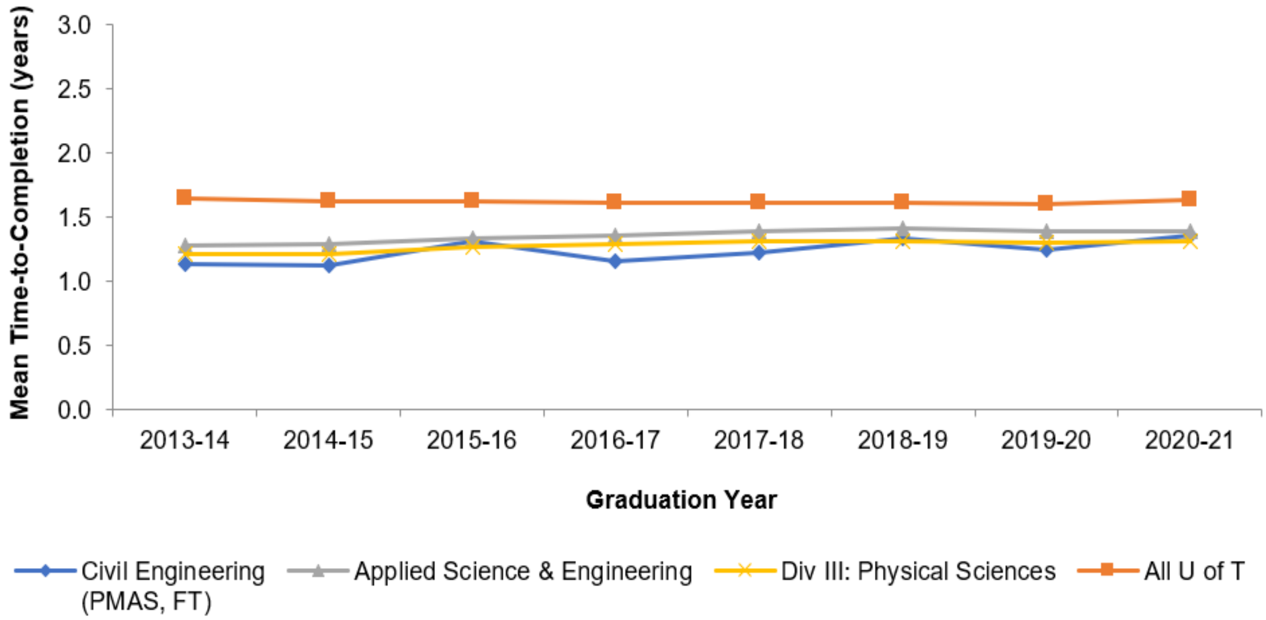
- the remaining four of the 10 courses may be taken outside of the CivMin department, and may include APS courses, courses offered through other Engineering departments, or offered through other faculties

- in all cases the student's proposed program of study must be approved by the Department's Associate Chair – Graduate Studies.

MEng students who wish to redirect their studies more toward research-based learning may apply for transfer to the MASc program, provided they have the agreement of a faculty member to supervise them and provide funding.

The Department's achievement in time-to-completion of the (full-time) MEng program is consistent with Faculty, Divisional and University-wide norms, averaging at 1.3 years.

Figure 2.24 Time-to-Completion Master of Engineering (Full-time) 2014-2021



Data Source: ROSI, screen 4BEA (Years to Graduate).

2.3.4 Master of Applied Science in Civil Engineering (MASc)

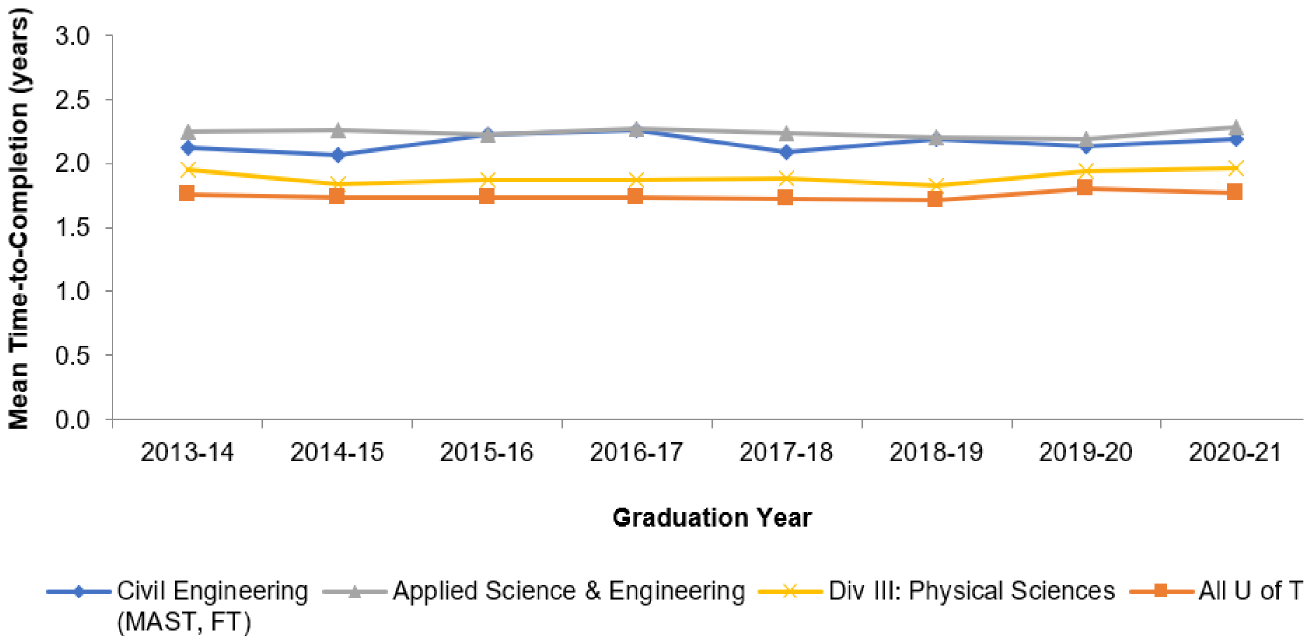
The breadth of research conducted in the Department of Civil & Mineral Engineering addresses the need for innovative solutions to a wide range of society's needs, from nanoscale-based methods for water treatment to large-scale tests of structures under varying degrees of simulated earthquakes, to development of mass transit models to solve urban congestion. Research is informed by extensive collaboration and interaction with industry and government partners.

The Master of Applied Science (MASc) program is a research-based program, requiring students to complete a minimum of 2.5 FCEs (i.e., five half-courses) and a thesis completed under the supervision of a CivMin faculty member. Students must participate in the non-credit seminar course JDE1000H: Ethics in Research during their first or second session of registration. In addition to their core research area, students also have the option of completing an emphasis in Sustainable Energy as part of their degree program: Emphasis in Sustainable Energy - Engineering Graduate Studies (utoronto.ca).

The program is generally completed within 24 months, but as with all enterprises involving research, MASc students may be granted up to three years to complete their program. MASc students may also be permitted to transfer into the PhD program under the same supervisor, typically following their first full year of study (i.e., three academic sessions).

The MASc program is only available on a full-time registration basis. The following chart demonstrates the Department's consistency in achieving timely student success in the program.

Figure 2.25 Time-to-Completion – Master of Applied Science 2014-2021



Data Source: ROSI, screen 4BEA (Years to Graduate).

2.3.5 Doctor of Philosophy in Civil Engineering (PhD)

The PhD program is designed for outstanding individuals interested in a rewarding career in fundamental or applied research. This program involves advanced courses and an intensive research program culminating in a thesis.

Applicants may enter the PhD program via one of three routes: 1) following completion of an MEng or MASc in a relevant degree; 2) transfer from the University of Toronto MASc program; 3) direct entry following completion of a bachelor's degree.

The number of course credits required to successfully complete the PhD program is dependent upon a candidate's prior academic preparation. For example, students with an MASc degree are required to complete 2.0 FCEs (or four half courses), students with an MEng degree are required to complete a minimum of 4.5 FCEs (or nine half-courses) of which 3 FCEs may be used from the MEng program towards the PhD course requirements, and students who transfer to the PhD program from the MASc program must complete a total of 4.5 FCEs. Students entering the PhD program with a bachelor's degree may be required to complete additional courses in preparation for advancement to the research component of the program. It is expected that at least one of the half courses will be taken outside of the student's principal area of study, and in all cases, PhD students must participate in the non-credit seminar course JDE100H: Ethics in Research.

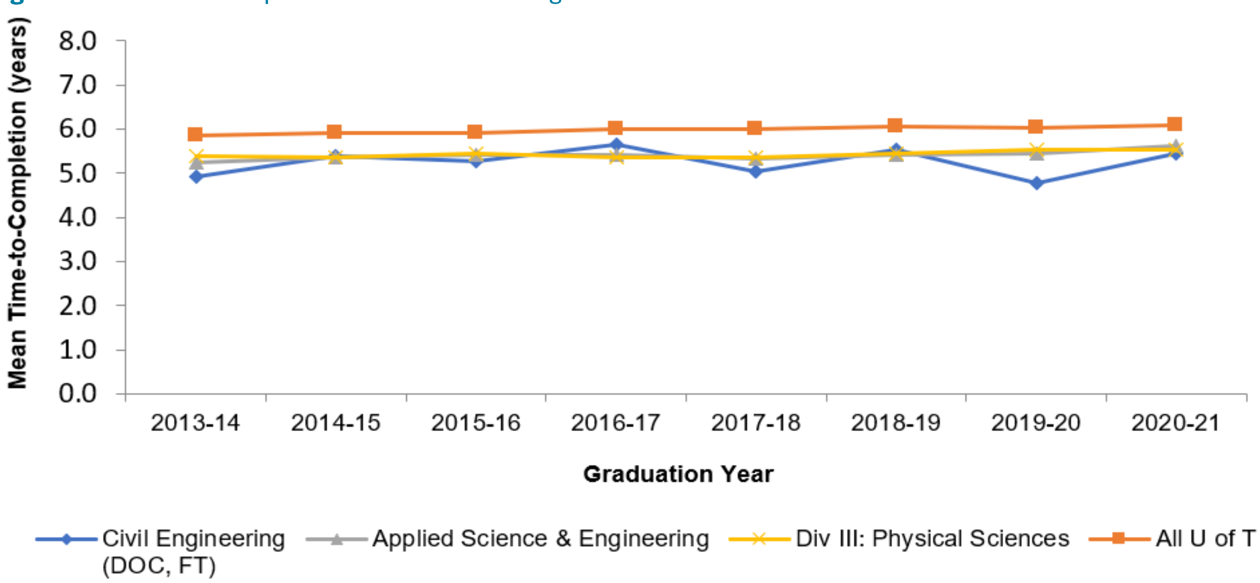
Prior to advancing to the in-depth research component of their program, PhD students must qualify by undergoing a comprehensive examination in which the student must respond to a set of specially crafted questions relevant to their research direction. This is usually conducted shortly after the student's first full year of study. The examination is overseen by a Comprehensive Examination Committee composed of a minimum of four graduate faculty members. Committee members are nominated by the student's supervisor, and the Department appoints a chair that is from an area other than the major research area of the candidate.

There are two elements to the examination. A written component in which the candidate must provide responses to a series of questions prepared by the members of the examination committee. The written response must be submitted within a designated period of time, usually within five working days of receipt of the questions, and the candidate may be permitted to prepare their response without direct supervision. This is followed up with an oral component in which the candidate must meet with the examination committee for further assessment of their subject knowledge and research ability.

Following successful progress through the comprehensive examination, the student continues towards completion of their program through development and defense of their primary research thesis. Each PhD student is required to have a PhD supervisory committee (supervisor and two other faculty members or adjunct professors from industry) that meet at least once per year to review the student's progress.

The allowable program length for completion of PhD programs at U of T has been established at six years, but the Department itself has been diligently working towards encapsulating this to within a four to five-year span. Although we achieved good progress towards this goal in 2019-20, with the average time-to-degree completed within 4.8 years, disruptions generated by COVID-19 protocols resulted in a slight extension to an average program length of 5.5 years in 2020-21. We expect this will improve once again as we regain normal institutional operations.

Figure 2.26 Time-to-Completion Full-time Doctoral Degrees 2013-14 to 2020-21



Data Source: ROSI, screen 4BEA (Years to Graduate).
Note 1: Time-to-completion (TTC) calculations only include sessions in which students are registered. Sessions on leave or lapsed sessions are not part of the TTC values.
Note 2: Time-to-completion values are based on a student's first to last registered session. For students that transfer from a research master's to a PhD degree, TTC is counted from the first session of the master's program to the last session of the doctoral program.

Flexible-Time PhD Program

While PhD programs have historically been conducted on a full-time basis, in recent years the Department has consistently received inquiries and applications from active professional engineers engaged in a variety of work scenarios, for example permanent or contractual work, self-employment and/or consulting services. Recognizing that these applicants possess the appropriate qualifications and relevant experience required to undertake in-depth study and research, and understanding that through the benefit of acquiring a PhD these individuals would, in turn, contribute significantly to research in the fields of civil or mineral engineering, the Department set out a pathway to introduce a flexible-time registration option. Through this option these professionals will be able to undertake CivMin's PhD program while continuing to work.

Admission requirements align fully with the requirements for entry into the full-time PhD program, with one specific proviso that applicants must demonstrate that they are actively engaged in professional activities related to their proposed program of study.

The Department received full approval to institute this program option in July, 2022 via the University's governance process and annual report to the Ontario Quality Council, and the option will be fully activated for program registrations in conjunction with the September, 2023 admissions cycle. It is anticipated that the addition of the Flexible-time option will initially increase the enrolment of PhD students in CivMin by one to two students per year.

2.3.6 Graduate Student Financial Support

As previously noted, professional degree programs are self-funded, while students in our research/doctoral stream programs receive full financial support throughout their program. The individual student's funding package is derived from external fellowships and scholarships the candidate may have independently secured, combined with a research assistantship provided by the student's academic supervisor (via the supervisor's research grants) and a fellowship provided from departmental operating funds. In the 2022-23 academic year the minimum guaranteed financial support for CivMin research stream students was factored as follows:

- MASc students: $17,000 plus tuition and fees per year, for up to 2 years beyond the Bachelor's degree
- PhD students: $18,500 plus tuition and fees per year, for up to 4 years beyond the Bachelor's degree
- PhDU (Fast-track Bachelor's to PhD): 5 years of guaranteed funding beyond the Bachelor's degree
- Flexible-time PhD students do not normally receive financial support from the Department

However, as the cost of living in the city of Toronto has escalated over the past year the Department has recognized that these amounts of support are no longer sufficient to meet our students' basic needs. As such our faculty members recently approved a motion to increase the amount of funding provided through research assistantships. Therefore, commencing in the 2023-24 academic cycle the minimum funding level for MASc students will be increased to $18,500 and to $20,000 for PhD students, plus tuition and fees, with further increases planned for subsequent years. It should be noted that many supervisors provide research assistantships at higher levels than those stipulated for the minimum funding packages.

External Fellowships

Figures 2.27 and 2.28 below show the success rate of CivMin doctoral students in securing external fellowships, which is fully aligned with that of the Faculty and Division III. In the 2020-21 academic cycle 14.3% of CivMin MASc students and 18.6% of PhD students received awards, as compared to the Faculty average at 13.5% (MASc) and 18.2% (PhD), and Division III averages at 12.8% and 21% respectively.

Figure 2.27 Percentage of MASc Students with External Fellowships/Scholarships 2013-14 to 2020-21

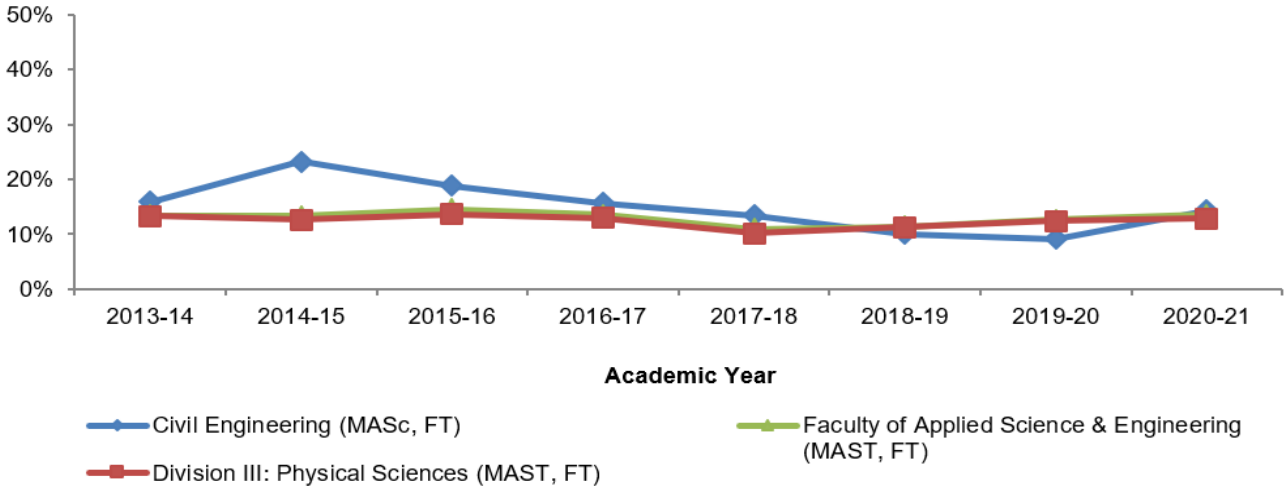
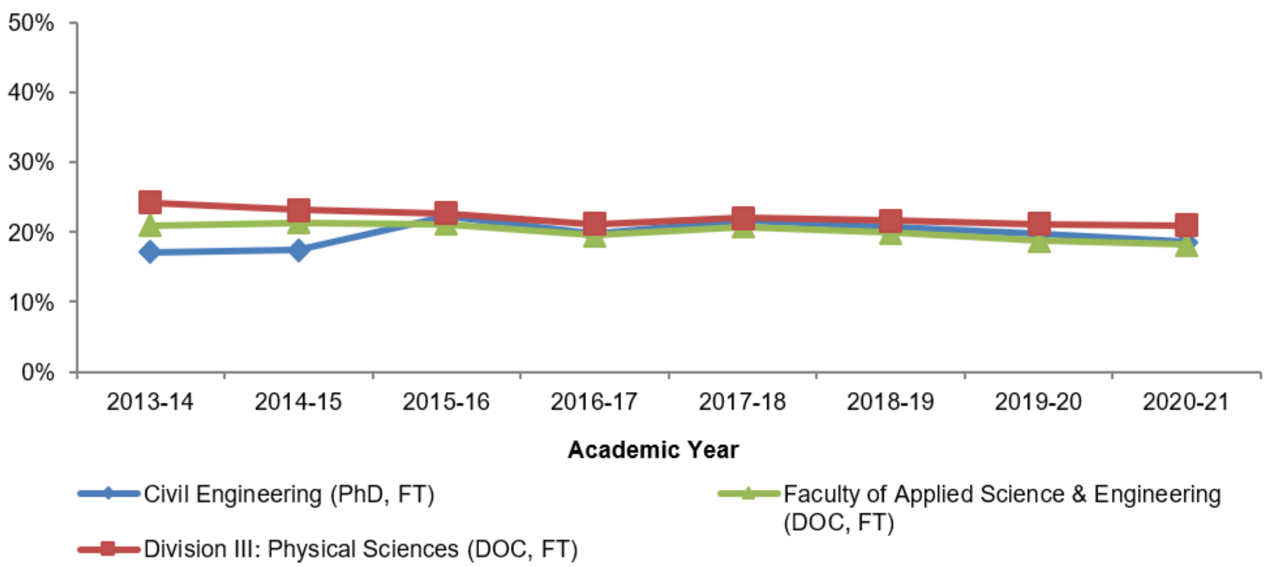


Figure 2.28 Percentage of Doctoral Students with External Fellowship/Scholarships 2013-14 to 2020-21



Data Source: Student Accounts cube

Note 1: The academic year consists of Fall, Winter, Summer terms. For example, 2020-21 academic year consists of Fall 2020, Winter 2021 and Summer 2021 terms.

Note 2: Students with Fellowships/Scholarships' data represent the number of full-time students receiving external, merit-based awards in the given year.

Note 3: The Student Accounts cube includes all students in all programs for transactions that are processed through ROSI and HRIS. OSAP loans and Grants are excluded.

Note 4: External fellowships/scholarships include: Income - awards grad - Fellowships/scholarships (Federal-CIHR, Federal-NSERC, Federal-SSHRC, Outside-Other, Provincial-Any, Provincial-OCGS) plus Other (Federal-NSERC, Federal-SSHRC, Outside-Any, Province-Other); Award Income Source=External to U of T.

The total amount of funding available to graduate students who are successful in securing external scholarships can be reviewed on the Department's website at: Department of Civil & Mineral Engineering Graduate Fees, Scholarships, and Funding (utoronto.ca). A complete copy of the Civil & Mineral Engineering Department's funding packages for 2022-23 can also be found in Appendix B.7.

With respect to the total amount of student funding derived from departmental and research funds and internal and external scholarships, the following chart demonstrates the steady growth in this expense area over the past five-year period, increasing from $4.7-million in 2017-18 to $6.2-million in 2021-22. This is exclusive of teaching assistantships which, although not included in our graduate funding packages, represents both additional income for our students and an added departmental cost of approximately $1-million per year.

Table 2.13 Department of Civil & Mineral Engineering Graduate Student Funding, 2016-17 to 2021-22

Department of Civil & Mineral Engineering Graduate Student Funding, 2016-2017 to 2021-2022					
	2017-2018	**2018-2019**	**2019-2020**	**2020-2021**	**2021-2022**
Department Funds	$ 895,861.02	$ 1,233,580.03	$ 1,326,431.78	$ 1,311,811.61	$ 1,256,853.14
Research Funds	$ 2,819,691.00	$ 3,447,863.00	$ 3,445,515.00	$ 3,407,045.00	$ 3,902,570.00
Endowed Awards	$ 105,547.00	$ 128,341.00	$ 122,659.26	$ 194,640.44	$ 208,417.07
Faculty Awards	$ 120,946.02	$ 127,095.00	$ 115,080.00	$ 168,979.99	$ 190,122.31
Other Awards	$ 778,111.16	$ 908,052.38	$ 737,700.37	$ 674,079.01	$ 664,655.60
TOTAL STUDENT FUNDING	$ 4,720,156.20	$ 5,844,931.41	$ 5,747,386.41	$ 5,756,556.05	$ 6,222,618.12
Teaching Assistantships	$ 968,408.84	$ 916,018.49	$ 943,382.24	$ 948,739.30	$ 1,082,648.96
Notes:					
Department and Research data extracted from U of T AMS: HRIS					
Award data extracted from U of T Repository of Student Information (ROSI)					
Teaching Assistantships are not included in student funding packages, but are noted here as an indicator of departmental cost					

Teaching Assistantships

All research-stream graduate students registered in the Department are eligible to apply for Teaching Assistant positions (TAships) as a way of earning extra income and developing their professional skills. The income earned from a TAship does not affect a MASc or PhD student's guaranteed funding package. However, teaching assistant positions at the University are unionized under the CUPE3902 collective bargaining unit, and as such there are very specific guidelines which must be adhered to with respect to the advertisement and promotion of positions, applicant hiring processes, and allocation of subsequent appointments.

Graduate Programs Curriculum and Program Delivery

In assessing the graduate programs offered by the Department of Civil and Mineral Engineering it is important to present the doctoral-stream programs (MASc, PhD) as distinct from the professional engineering programs (MEng, MEngCEM), due to the distinguishable nature of these two program streams. Doctoral-stream programs place emphasis on research and development, while the emphasis of the professional programs is on practical application. Nevertheless, all CivMin graduate courses are open to students from all programs, with course selection based on the student's chosen area of specialization.

Additionally, all students undertaking a CivMin graduate program must participate in and receive a non-graded credit for the JDE1000Y – "Ethics in Graduate Research" seminar, offered through the Faculty, and generally taken at the commencement of the student's given program. All students working within laboratory environments are also required to undertake the appropriate Environmental Health & Safety (EH&S) training relative to their area of specialization. The EH&S courses are offered through the University's Environmental Health & Safety Office and are supplemented by lab-specific training offered by department staff where appropriate.

While many of the courses offered through our graduate programs can be of equal value to both doctoral-stream and professional practice students, there are areas where these programs branch off to provide courses pertinent to the respective degree type, or research specialization area. For example, all of the CEM core courses (CEM1000, CEM1001, CEM1002, CEM1003, CEM1004) are designed specifically for students enrolled in the Cities and Engineering Management MEng program. The CIV Special Studies courses ending in numbers 98 or 99 (i.e., CIV1198, CIV1299) are often utilized to pilot new courses within the confines of a limited or targeted enrollment, or as one-time-only offerings to enable all of our graduate students the opportunity to engage in in-depth courses within their area of study. Doctoral-stream students may also take individualized "Special Studies" reading courses which may be guided by their supervisors. The Entrepreneurship Leadership, Innovation and Technology in Engineering (ELITE) suite of courses listed under course code APS are only available for credit to MEng students undertaking this program emphasis.

A copy of the School of Graduate Studies 2022-23 Calendar entry, outlining Civil Engineering graduate programs is attached in Appendix B.8, or can be viewed on-line at: [Civil and Mineral Engineering | School of Graduate Studies (SGS) Calendar (utoronto.ca)]

The Department has a number of specialized lab facilities available to aid student research, for example the Drinking Water Research Laboratory, the Groundwater Research Laboratory, the Rock Fracture Dynamics Lab, the Structural Testing Facility, the Intelligent Transportation Systems Lab, the Concrete Materials Laboratory, and the Mining, Water and Environment Laboratory. Particulars regarding these and other departmental facilities will be discussed in Section 6 of this report.

We also collaborate with other departments to secure access to courses that will build upon our students' core knowledge base and provide breadth. For example, graduate students working in the area of water technologies take a core course offered through the Chemical Engineering department (CHE1150: Industrial Water Technology), students focusing in Building Science take MIE507: HVAC Fundamentals as a core course, and students specializing in the transportation field commonly take MIE1517: Introduction to Deep Learning. Graduate students may also individually request permission to take courses pertinent to their field of research that are available through other departments at U of T, or through partner institutions approved by the School of Graduate Studies.

The Department also strives to keep our graduate course offerings current and encompassing of new directions in research and practice and has introduced a myriad of new graduate courses, for example:

CIV1283: Advanced Asset Management: Quantitative Tools and Methods

CIV1285: Building Information Modelling

CIV1322: Quantitative Methods for Decision Making

2.3.7 Assessment of Learning

Graduate Degree Level Expectations

Similar to the provincially tabled UDLE's that serve as the formal measures for determining the competencies, knowledge and skills of students graduating from our undergraduate programs, the FASE developed a similar set of degree level expectations (GDLEs) to guide assessment of our MEng, MASc and PhD programs. However, the learning outcomes are typically defined on a more broad and comprehensive scale at the graduate level than at the undergraduate level. These GDLEs were adopted by all departments of the Faculty in March 2011, and have been employed in our assessment of graduate learning since.

Each of the GDLEs consists of six sets of expectations, five of which are shared among the three programs. The sixth expectation is different for MEng ("Knowledge of Methodologies") and MASc and PhD students ("Research and Scholarship"). Detailed descriptions of the Faculty GDLE's prescribed for each of our graduate programs is attached in Appendices B.9, B.10 and B.11. The following briefly explains how our programs and curricula enable graduate students to achieve these expectations.

GDLE 1: Depth and Breadth of Knowledge

Assessment of the depth and breadth of knowledge achieved through our Master of Engineering programs is generally ascertained from student success in courses and overall academic standing. To summarize, the MEng program consists of 10 one-semester courses, six of which have to be from the Department of Civil and Mineral Engineering. The remaining four can be from outside of the Department, and two of these can be from outside of the Faculty of Applied Science of Engineering, or outside of the University of Toronto. MEng students also have the option of completing a one or two course-equivalent project, which counts toward the six Civil courses, and are encouraged to concentrate their course selections in one of the nine areas of specialization to gain depth of knowledge in a particular area. MEng students can also broaden their knowledge with courses offered through the Faculty's ELITE program, which provides opportunity to gain exposure to concepts in entrepreneurship, leadership, and innovation.

Students in the Cities Engineering and Management MEng Program (MEngCEM) must complete four mandatory courses and complete a four-month internship. In addition, MEngCEM students are required to complete five elective courses; four of these are infrastructure engineering electives, chosen from one of the program specialization areas. The final elective is selected from a list of technology management courses, and is meant to provide breadth.

Doctoral-stream program students achieve depth of knowledge primarily through thesis work, so are expected to devote the greater portion of their time toward research. In preparation for the research component of their program, MASc students are required to take five courses, while PhD students must take a minimum of four. To ensure depth within their area of research specialization, students choose their course selections in consultation with their academic supervisor. Students are also encouraged to take courses from other departments and outside the FASE for breadth.

Level of knowledge application is maintained by exposing students to technical courses and scientific research. Civil engineering is by nature an applied discipline and our technical courses typically include applications of scientific principles and design concepts. Many of our courses include projects that offer additional opportunities for students to apply knowledge to solving problems.

MEng students in the project option, and MASc and PhD students further build competence in the application of knowledge to develop solutions for targeted and often complex problems.

GDLE 3: Professional Capacity / Autonomy

Our students are encouraged to practice personal responsibility, accountability, intellectual independence, and academic integrity throughout their degree program. We encourage them to participate in the professional skill development series offered by the U of T School of Graduate Studies (SGS). Students can also develop professional capacity and autonomy by taking courses such as those offered by the Faculty's ELITE program.

MASc and PhD students are provided additional opportunities to develop these skills and autonomy via their research work. PhD students may also participate in the Prospective Professors in Training Program.

There are also numerous student chapters of professional organizations available to engage students more fully in their chosen field, and expand their networking opportunities.

GDLE 4: Level of Communication Skills

Our graduate students have a range of opportunities in which to learn and practice their written and oral communication skills. Graduate course work is imbued with opportunity to develop communication skills in the form of written assignments and oral presentations. To enhance this, the Department recently launched its “Grad Lightning” series in which doctoral students are invited to showcase their research in a rapid presentation format. The series is held once each semester with the Winter term series being partnered with our annual “Graduate Research Day”. Pre-registration is requested but attendance is open to all students in the department. Further, many of our courses involve team projects which also serves to enhance interpersonal communication skills among team members.

Doctoral-stream students also contribute to peer-review published papers, often listed as first author, and their supervisors ensure that opportunities to present their work in public forums such as conferences are available to the greatest extent possible. The School of Graduate Studies provides a mechanism for securing funding to attend a conference in instances where a lack of funding to participate in a conference program is a hindrance.

A further element for measuring the effectiveness of communications within our doctoral-stream PhD program is the external review of the student thesis. Although the student’s academic supervisor nominates the external examiner, the appointment is approved by the School of Graduate Studies. This ensures an unbiased assessment of the work, free of conflict of interest, and therefore challenges the student to articulate their work professionally and to the best of their ability.

GDLE 5: Awareness of the Limits of Knowledge

Students develop an awareness of the limits of knowledge while taking technical courses. MEng students choosing a project option are exposed to additional opportunities through the process of defining the project’s scope and objective.

For MASc and PhD students, ongoing literature review is an essential part of the research process, thus providing opportunity to develop an awareness of the limits of established and/or shared knowledge, and guides their decision-making when planning future directions in their work.

GDLE 6: Knowledge of Methodologies (MEng students) / Research and Scholarship (MASc and PhD students)

MEng students are required to take various technical courses and are expected to gain knowledge of discipline-specific methodologies. Students who choose to do a project are also exposed to research methodologies.

The MASc and PhD programs in Civil and Mineral Engineering are research-intensive. Therefore, students are guided by their academic supervisor and (for PhD students) their Supervisory Committee in developing their abilities to identify and formulate research questions, design and implement a research plan to generate new knowledge or understanding, and analyze experimental data and/ or computational results to develop and formulate new concepts. Students learn to articulate their findings in the form of a written thesis, and through submission of research papers to scholarly peer reviewed publications. Additionally, PhD students are expected to become specialists in their fields and lead independent research programs.

MASc students work towards these same goals, but with contributions scaled to the shorter duration of the MASc program.

2.3.8 Student Satisfaction

Student satisfaction at program completion is a meaningful measure of success for our graduate programs. Tables 2.14, 2.15 and 2.16 below demonstrate that U of T Civil Engineering graduate students are largely very satisfied with their educational experience. Ratings for our doctoral and research-stream programs indicate that our students view the quality of our teaching, research training, and supervision slightly above those of the U15 Engineering schools.

Table 2.14 Student Satisfaction Benchmark – Doctoral Students 2010-2019

Benchmarks 1 and 2 Means are out of 5 (1=Poor, 2=Fair, 3=Good, 4=Very Good, 5=Excellent)
Benchmark 3 Mean is out of 4 (1=Strongly Disagree, 2=Disagree, 3=Agree, 4=Strongly Agree)

Benchmarks	CGPSS	U of T (CIVIL)	U15 (CIVIL[1])	U of T (All disciplines)	U15 (All disciplines)	Ontario (All disciplines)
Number of Respondents	2010	33	184	2,086	8,047	4,685
	2013	61	346	2,681	10,015	5,585
	2016	41	312	2,253	10,181	6,423
	2019	40	441	2,208	11,686	6,770
1. Quality of Teaching	2010	3.98	3.41	3.86	3.73	3.74
	2013	3.68	3.53	3.80	3.74	3.77
	2016	3.80	3.58	3.84	3.77	3.80
	2019	4.06	3.68	3.79	3.78	3.82
2. Research Training and Career Orientation	2010	3.06	2.69	2.88	2.74	2.70
	2013	3.03	2.79	2.81	2.70	2.70
	2016	3.26	2.97	2.83	2.82	2.78
	2019	3.32	2.98	2.89	2.85	2.80
3. Supportive Dissertation Advisor	2010	3.30	3.25	3.30	3.29	3.33
	2013	3.28	3.25	3.30	3.31	3.36
	2016	3.44	3.28	3.33	3.34	3.38
	2019	3.30	3.28	3.31	3.33	3.41

[1]Program comparison group is based on the Classification of Instructional Programs (CIP) code 14.0801 (Civil engineering, general).
https://www23.statcan.gc.ca/imdb/p3VD.pl?Function=getVD&TVD=299355

Note 1: U of T, U15, and Ontario values only include responses from doctoral students.

Note 2: U15 and Ontario values exclude University of Toronto.

Note 3: U15 includes Alberta, British Columbia, Calgary, Dalhousie, Laval, Manitoba, McGill, McMaster, Montreal, Ottawa, Queen's, Saskatchewan, Waterloo, Western.

Table 2.15 Student Satisfaction Benchmark – Research Master's Students 2010-2019

Benchmarks 1 and 2 Means are out of 5 (1=Poor, 2=Fair, 3=Good, 4=Very Good, 5=Excellent)
Benchmark 3 Mean is out of 4 (1=Strongly Disagree, 2=Disagree, 3=Agree, 4=Strongly Agree)

Benchmarks	CGPSS	U of T (CIVIL)	U15 (CIVIL[1])	U of T (All disciplines)	U15 (All disciplines)	Ontario (All disciplines)
Number of Respondents	2010	26	155	868	7,582	5,687
	2013	46	269	1,397	9,172	6,401
	2016	47	269	1,139	9,060	6,966
	2019	33	335	1,112	9,658	6,464
1. Quality of Teaching	2010	4.26	3.86	3.92	3.85	3.84
	2013	3.83	3.70	3.93	3.83	3.85
	2016	3.93	3.89	3.95	3.89	3.91
	2019	4.12	3.88	3.96	3.94	3.93
2. Research Training and Career Orientation	2010	3.20	2.97	3.06	2.82	2.79
	2013	2.59	2.96	2.91	2.77	2.80
	2016	3.07	3.06	3.04	2.94	2.93
	2019	3.46	3.14	3.08	2.98	2.94
3. Supportive Dissertation Advisor	2010	3.51	3.36	3.32	3.29	3.31
	2013	3.16	3.28	3.28	3.31	3.33
	2016	3.30	3.38	3.36	3.37	3.42
	2019	3.63	3.35	3.37	3.38	3.40

[1]Program comparison group is based on the Classification of Instructional Programs (CIP) code 14.0801 (Civil engineering, general).
https://www23.statcan.gc.ca/imdb/p3VD.pl?Function=getVD&TVD=299355

Note 1: U of T, U15, and Ontario values only include responses from research master's students.

Note 2: U15 and Ontario values exclude University of Toronto.

Note 3: U15 includes Alberta, British Columbia, Calgary, Dalhousie, Laval, Manitoba, McGill, McMaster, Montreal, Ottawa, Queen's, Saskatchewan, Waterloo, Western.

Table 2.16 Student Satisfaction Benchmark – Professional Master's Students 2010-2019

Means are out of 5 (1=Poor, 2=Fair, 3=Good, 4=Very Good, 5=Excellent)

Benchmarks	CGPSS	U of T (CIVIL)	U15 (CIVIL[1])	U of T (All disciplines)	U15 (All disciplines)	Ontario (All disciplines)
Number of Respondents	2010	29	74	1,861	5,110	4,012
	2013	36	116	2,411	6,782	5,038
	2016	30	87	2,121	6,308	5,454
	2019	24	231	2,721	11,132	9,045
1. Quality of Teaching	2010	3.77	3.65	3.89	3.77	3.76
	2013	4.00	3.72	3.88	3.79	3.74
	2016	4.06	3.80	3.84	3.82	3.78
	2019	3.97	4.07	3.84	3.88	3.83
2. Research Training and Career Orientation	2010	2.78	3.06	3.19	3.15	3.17
	2013	2.98	3.03	3.23	3.17	3.08
	2016	2.97	2.84	3.29	3.21	3.19
	2019	3.15	3.41	3.31	3.29	3.28

[1]Program comparison group is based on the Classification of Instructional Programs (CIP) code 14.0801 (Civil engineering, general).
https://www23.statcan.gc.ca/imdb/p3VD.pl?Function=getVD&TVD=299355

Note 1: U of T, U15, and Ontario values only include responses from professional master's students.

Note 2: U15 and Ontario values exclude University of Toronto.

Note 3: U15 includes Alberta, British Columbia, Calgary, Dalhousie, Laval, Manitoba, McGill, McMaster, Montreal, Ottawa, Queen's, Saskatchewan, Waterloo, Western.

Although our professional Master's students rank the quality of our teaching comparatively to that of the U15 Engineering schools, their view of the research training and career orientation provided is slightly below that of the U15 schools. While not a required aspect of their academic program, professional-stream graduate students are encouraged to attend doctoral-stream student presentations as well as our special speaker series, thus providing insight into our research and furthering the student's awareness of emerging discovery directions within the profession. Additionally, they have the option to select a research-based project as part of their academic program.

With respect to career orientation, we are working to improve upon our efforts in this area through our series of graduate career panel discussions, targeted career fairs, and encouraging participation in professional association activities. Our Master of Engineering in Cities Engineering and Management program requires students to complete an approved internship within a relative work setting, which significantly contributes to their career orientation.

Further, in 2021 the Department created an additional graduate programs advisory position, specifically dedicated to serving our professional Master's students. This has greatly improved our ability to provide meaningful guidance to both our research and professional-stream students, and we anticipate that overall student satisfaction in terms of program guidance and career orientation will continue to trend upward.

3. FACULTY

3.1 Faculty Composition

The Department's faculty complement currently rests at 42 appointed professors, although as four of these are jointly appointed with other FASE departments our actual FTE count is broadly factored at 40. During this review period (2018-2022) the Department has welcomed seven new faculty members, one of whom is holding an appointment bridged to a position that will become available upon the imminent retirement of a senior faculty member. This approach to succession planning has served the Department reasonably well in the past. Presently, we are awaiting the successful immigration of one other new faculty member, and candidate searches are currently underway to fill an additional two positions within the coming year.

Of our current group of 42 faculty, ten are at the rank of assistant professor, with two of these currently undergoing full tenure review, six are ranked at the associate professor level, and the remaining 26 are full professors. The following table summarizes all faculty currently appointed to the Department, listed by rank and within their respective research area as of December, 2022. All faculty members appointed to the Department of Civil and Mineral Engineering also hold graduate membership status with the School of Graduate Studies. A copy of the curriculum vitae of each of our faculty members can be viewed at CivMin - External Review - Home (sharepoint.com)

Figure 3.1 Department of Civil & Mineral Engineering, Appointed Faculty by Rank and Research Area, as at December 2022

Rank	Faculty	Thematic Research Group
Assistant Professor	Sarah Haines	Building Engineering
Assistant Professor	Daeho Kim	Building Engineering
Assistant Professor	Seungjae Lee	Building Engineering
Assistant Professor	Ibrahim Ogunsanya	Building Engineering
Assistant Professor	David Meyer *1	Environmental Engineering
Assistant Professor	Daniel Posen	Environmental Engineering
Assistant Professor	Mason Ghafghazi	Mining/Geotechnical Engineering
Assistant Professor	Sebastian Goodfellow	Mining/Geotechnical Engineering
Assistant Professor	Fae Azhari *2	Structural Engineering
Assistant Professor	Aryan Rezaei Rad	Structural Engineering
Associate Professor	Karl Peterson	Building Engineering
Associate Professor	Marianne Touchie *3	Building Engineering
Associate Professor	Elodie Passeport *4	Environmental Engineering
Associate Professor	Shoshanna Saxe	Environmental Engineering
Associate Professor	Kamran Esmaeili	Mining/Geotechnical Engineering
Associate Professor	Murray Grabinski	Mining/Geotechnical Engineering
Professor	Tamer El-Diraby	Building Engineering
Professor	Daman Panesar	Building Engineering
Professor	Jeffrey Siegel	Building Engineering

Rank	Faculty	Thematic Research Group
Professor	Bob Andrews	Environmental Engineering
Professor	Susan Andrews	Environmental Engineering
Professor	Ron Hofmann	Environmental Engineering
Professor	Bryan Karney	Environmental Engineering
Professor	Heather MacLean	Environmental Engineering
Professor	Brent Sleep	Environmental Engineering
Professor	Giovanni Grasselli	Mining/Geotechnical Engineering
Professor	John Hadjgeorgiou	Mining/Geotechnical Engineering
Professor	John Harrison	Mining/Geotechnical Engineering
Professor	Lesley Warren	Mining/Geotechnical Engineering
Professor	Evan Bentz	Structural Engineering
Professor	Constantine Christopoulos	Structural Engineering
Professor	Paul Gauvreau	Structural Engineering
Professor	Oh-Sung Kwon	Structural Engineering
Professor	Oya Mercan	Structural Engineering
Professor	Jeffrey Packer	Structural Engineering
Professor	Shamim Sheikh	Structural Engineering
Professor	Baher Abdulhai	Transportation Engineering & Planning
Professor	Marianne Hatzopoulou	Transportation Engineering & Planning
Professor	Eric Miller	Transportation Engineering & Planning
Professor	Khandker Nural Habib	Transportation Engineering & Planning
Professor	Matt Roorda	Transportation Engineering & Planning
Professor	Amer Shalaby	Transportation Engineering & Planning

Note 1: 51% CIV, Jointly appointed: ISTEP

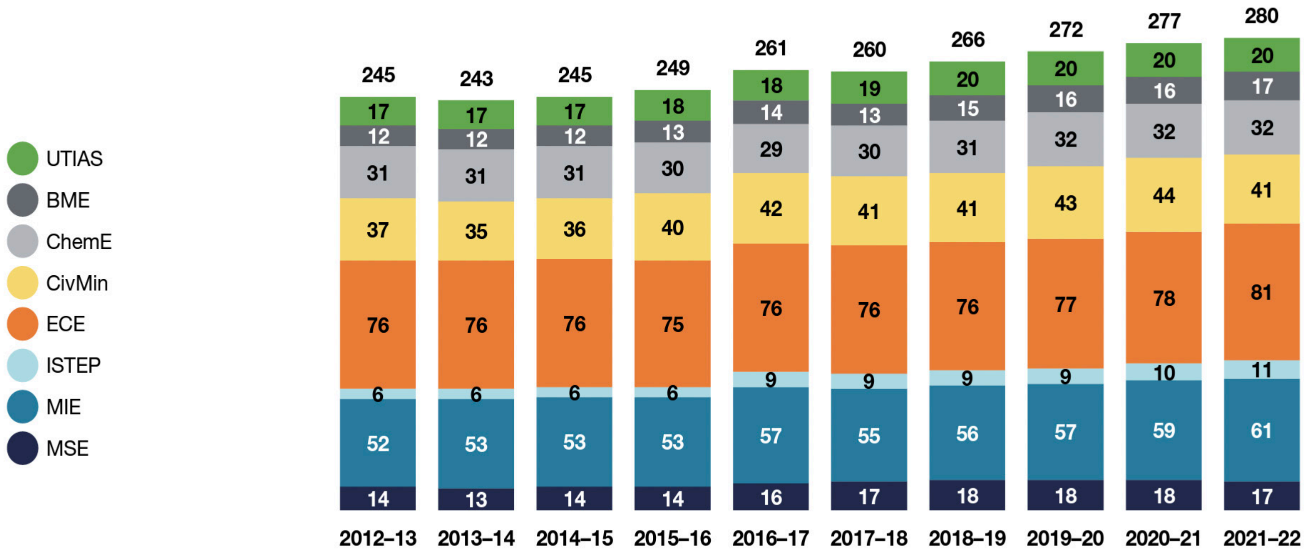
Note 2: 49% CIV, Jointly appointed: Mechanical & Industrial Engineering

Note 3: 51% CIV, Jointly appointed: Mechanical & Industrial Engineering

Note 4: 51% CIV, Jointed appointed: Chemical Engineering & Applied Chemistry

In terms of our academic FTE ratio within FASE, the most recent tabulation of academic staff available, taken from data as at July 2021, shows that at that time the Department held 41 faculty appointments out of a total of 280, representing 14.65% of the FASE total. The chart below shows that although the total number of faculty increased within FASE over the tracked period, this was largely due to the inclusion of teaching stream appointments across the board, and the inclusion of ISTEP, which is largely identified as a teaching stream unit. As can be seen, the Department's FTE count remained fairly consistent over this same timeframe.

Figure 3.2 Total Number of Faculty by Academic Area 2012-13 to 2021-22



Note: Faculty are as of July 1, 2021 and do not include contractually limited term appointments (CLTAs).

3.2 Other Academic Appointments

3.2.1 Teaching Stream/CLTA/Part-time Faculty

The Department does not currently have any faculty who are distinctly appointed to Teaching Stream, on contractually limited term appointments, or engaged on a part-time basis. We do, however, maintain a roster of sessional instructors, and the Department also receives support in the communications area from teaching stream faculty in ISTEP.

3.2.2 Sessional Instructors

Faculty appointed to the Department generally adhere to our workload policy, which stipulates that each appointed faculty member will be responsible for teaching three courses within each academic cycle. This is considered to be a normal teaching load. However, in order to enable newly hired faculty members time and opportunity to build their research programs, these faculty members are not expected to carry a full teaching load during their first two years of service. In addition, teaching relief in consideration of substantive administrative service may be granted from time to time to individual professors upon request, although this is only granted at the discretion of the department Chair. Course instructor gaps can also occur in relation to research leaves and other earned leaves.

To ensure stability in our annual course offerings, the Department maintains a roster of sessional instructors, generally enlisted from among our alumni who are actively working within the profession and who have proven to provide good quality instruction to our students. In our view this also helps to ensure that our courses are current with the most up-to-date developments in professional practice. This is most notable with respect to CIV498, our 4th Year Capstone Group Design Project course, which is most often led by sessional instructors from industry.

In the 2022-23 academic cycle, the Department contracted a total of 17 sessional instructors to cover courses offered in the Fall term, four of which were assigned to teach a section of the 1st Year CIV100 course, five were assigned to teach various Civil undergraduate engineering courses, two were engaged to teach Mineral engineering courses, and the remaining six were contracted to teach highly specialized graduate courses.

In the Winter term, we engaged a total of 37 sessional instructors, with eight of these leading a section of the CIV498 Capstone course and one leading the Mineral Engineering capstone course, MIN467. Two instructors were retained to teach first year courses (one Civil and one Mineral course), six were contracted to teach Mineral Engineering courses, and five others provided instruction to core Civil Engineering undergraduate courses. Another seven were hired to teach 500 level elective courses open to both undergraduate and graduate students, and eight were hired to teach specialized graduate courses. By way of providing an example of the range of professionals we engage as sessional instructors a listing of the courses taught by sessional instructors in the 2022-23 academic cycle is included in appendix. (App. C.1.)

It is also our practice when covering faculty research leave absences to assign a few senior PhD students to teach or co-teach some of our first to third year undergraduate courses each year in order to give them full-scale teaching experience. This approach to course delivery has proven to be extremely effective, as the student instructors generally receive very high ratings in their teaching evaluations. The student instructors are hired according to CUPE3902 (University of Toronto Education Workers) Unit 1 guidelines.

Additionally, there are a number of emeritus professors who also generously continue to support the Department through various forms of participation, such as serving as examination chairs for departmental PhD exams.

3.3 Workload

Overall responsibility for overseeing faculty workload rests with the department Chair, who is expected to allocate work and service assignments in a manner that allows the Department to function optimally, serves the best interests of the Department, and is conducted in a collegial and fair manner. To guide this process the Department prescribes to the terms outlined in our "Workload Policy and Procedures for Faculty in Civil & Mineral Engineering" (see Appendix C.2.)

The policy defines workload within the three key components comprising academic activities: Research, Teaching, and Service. The Teaching and Service elements are relative to those aspects of workload that are assignable by the department Chair. As Research is viewed as a primarily self-directed aspect it is fully recognized as a component but not specifically detailed within the policy. The Chair advises all faculty of their annual teaching assignments and administrative duties in writing at the outset of each academic cycle. Teaching and service assignments for all faculty are complied in a list that is accessible to all faculty in the Department.

Workload assignments are reviewed on an annual basis and, where appropriate, adjustments are made in order to ensure that workload balance is maintained across-the-board. The objective is to ensure that each faculty member is encouraged to contribute and lead in the operations of the Department, is engaged in service, and allows each faculty member to thrive in all aspects of their work.

3.4 Faculty Administrative Service

Of our complement of 42 faculty members 33, or 79%, currently carry additional administrative responsibilities on behalf of the Department, the Faculty, or the University. Further, within this group 19, or 45%, carry more than one additional administrative responsibility. This is exclusive of their teaching responsibilities, their research activities, and their collaborative affiliations with research clusters and/or industrial research partnerships (these activities are detailed separately within the Research section to follow). A table summarizing the administrative positions held by CivMin faculty as of December, 2022 is available in appendix (see App. C.3.)

3.5 Equity, Diversity and Inclusion

The Department is fully committed to proactively supporting the University's key priorities in fostering equity, diversity and inclusion in all aspects of our enterprise. With respect to how equity and diversity is represented within our faculty composition, of our current complement of 42 faculty 11, or 26%, are women, 20 or approximately 48% represent individuals of ethnocultural identity, and two of our recent faculty hires received support via the University Fund Special Initiatives - Diversity in Academic Hiring Fund.

3.6 Faculty Mentorship, Promotion and Professional Development

The 2017-18 external reviewers put forward the following recommendation for the Department's consideration:

> *In examining the faculty experience within the Department, the reviewers noted gaps in mentorship and feedback surrounding faculty promotion. The reviewers recommended improving the documentation and communications for tenure expectations, and prioritizing untenured faculty space, resources and feedback.*

With respect to mentorship, following the 2018 review the Department elected to revisit its guidelines for mentoring junior faculty to ensure that all areas incumbent in the successful onboarding of new faculty were sufficiently addressed. A copy of the current "Guidelines for Mentoring Junior Faculty" is attached in appendix (Appendix C.4.) The department Chair follows the stated process of assigning a mentor from among our senior faculty to provide support and guidance to each new faculty member for a two-year term. Mentor appointments and expectations are confirmed in writing, and mentors are required to submit a summary report to the department Chair on an annual basis, outlining how the mentorship is progressing and addressing any areas where additional support may be beneficial for the mentee.

In addition, new faculty members are directed to the wealth of resources available through the University's Division of the Vice-President, Research & Innovation. These can viewed on their website at New Faculty Onboarding: Getting Started in Research & Innovation (utoronto.ca).

The University's Family Care Office also offers the Faculty Relocation Service, which provides guidance and support to newly arrived faculty members in becoming established and managing the more personal aspects related to relocating to Toronto. Further, the Faculty maintains the Engineering Faculty & Staff Hub, an intranet which provides quick and comprehensive access to administrative, research, course instruction, and professional development resources and information.

Likewise, the Department provides similar access at the departmental level to all faculty members through the "Faculty Resources" page of our website (see For Faculty – Department of Civil & Mineral Engineering (utoronto.ca)

Over and above this all staff of the Department, both academic and administrative, are available on a daily basis to assist our new faculty in becoming oriented, in adapting to University systems, and in providing access to resources.

3.7 Annual Reviews and Promotions

With regard to performance review, all faculty are required to submit an annual report detailing their research, teaching and administrative activities from the past year.

These reports are reviewed and assessed on an annual basis in conjunction with the University's "Progression through the Ranks" (PTR) promotion process, a comprehensive exercise in which academic performance is assessed on the basis of teaching, service, research, creative professional achievement, and professional development activities. This annual review, conducted via the Department's PTR Committee, is integral to ensuring that our faculty continue to strive for excellence in all aspects of their professional life, and that their contributions and service to the University, Faculty, Department and profession surpass baseline expectations. The PTR Committee is comprised of a mix of senior and early career professors so that the early career professors can acquire insights into the PTR review process.

To provide direction in assessing teaching effectiveness in PTR decision-making, the Faculty's Teaching Methods and Resources Committee recently developed the guideline document "FASE Best Practices for Assessing Teaching Effectiveness in PTR Decisions" (see Appendix C.5) which has now been widely shared with all of our faculty members.

Finally, all faculty are encouraged by the Chair to pursue opportunities for professional development, whether this be through active participation in any of the various levels of governance of the University, participating in departmental and community events, attending conferences, or in developing new directions and connections for research collaboration. On a more basic level, the University offers a wide range of courses and services through its Centre for Learning, Leadership and Culture (LLC). Information regarding these services can be viewed at Learning and Leadership Centre – Professional Development at U of T (utoronto.ca).

3.8 Faculty Awards and Recognitions

Civil & Mineral Engineering faculty members have received numerous awards and recognitions for their academic and leadership excellence, both from within the University and the profession over the years. For example, Professors Elodie Passeport and Marianne Touchie have each received the Faculty's "Early Career Teaching Award" (in 2020 and 2022 respectively), Professor Evan Bentz is a past recipient of the Faculty Teaching Award, and Professor Bob Andrews, Heather MacLean and Eric Miller have all received external awards in recognition of their teaching excellence. The two tables below list the awards won by faculty of the Department over the period 2014-2021, as tracked in the UTQAP data as of January 2022. The first represents awards and honours conferred by bodies not specific to the field of civil or mineral engineering and provides a comparison of the Department's ratio of representation against the University total. The second represents awards and honours conferred by bodies specific to the fields of civil and mineral engineering.

Figure 3.3 Department of Civil and Mineral Engineering: List of Awards Not Exclusive to the Fields of Civil or Mineral Engineering Won by Faculty in the Department, 2014 to 2021

Award	Organization	Number of Awards Won in the Dept.	Number of Awards Won at U of T	Dept. Percentage of U of T Total
Brockhouse Canada Prize	Natural Sciences and Engineering Research Council of Canada	1	11	9%
Clean50 Emerging Leader	Corporate Knights	1	1	100%
Engineering Excellence Medal	Ontario Society of Professional Engineers	1	1	100%
Fellow	American Association for the Advancement of Science	1	13	7.6%
Fellow	Canadian Academy of Engineering	3	31	9.6%
Fellow	Canadian Engineering Education Association	1	7	14.2%
Fellow	Engineering Institute of Canada	5	17	29.4%
Fellow	Réunion Internationale des Laboratoires et Experts des Matériaux	1	1	100%
Fellow	Royal Academy of Engineering (UK)	1	1	100%
Inventor of the Year Award	University of Toronto	1	8	12.5%
Joan E. Foley Quality of Student Experience Award	University of Toronto	2	5	40%
Julian C. Smith Medal	Engineering Institute of Canada	2	3	66.7%
Research and Development Medal	Professional Engineers Ontario (PEO) / Ontario Society of Professional Engineers	1	5	20%
Vivek Goel Faculty Citizenship Award	University of Toronto	1	13	7.6%
Young Engineer Achievement Award	Engineers Canada	1	3	33.3%
Young Engineer Medal	Professional Engineers Ontario (PEO) / Ontario Society of Professional Engineers	2	3	66.7%
Total		**25**	**123**	**20.3%**

Figure 3.4 Department of Civil and Mineral Engineering: List of Awards & Honours Exclusive to the Fields of Civil or Mineral Engineering Won by Faculty in the Department, 2014 to 2021

Award	Organization	Number of Awards Won in the Dept.	Number of Awards Won at U of T	
A.B. Sanderson Award	Canadian Society for Civil Engineering	2	2	
Albert E. Berry Medal	Canadian Society for Civil Engineering	2	2	
Arthur J. Boase Award	American Concrete Institute	1	1	
Camille A. Dagenais Award	Canadian Society for Civil Engineering	1	1	
Fellow	Canadian Society for Civil Engineering	6	6	
Fellow	Institute of Materials, Minerals, and Mining	1	1	
Honorary Member	American Concrete Institute	1	1	
Horst Leipholz Medal	Canadian Society for Civil Engineering	2	2	
Joe W. Kelly Award	American Concrete Institute	1	1	
Lifetime Achievement Award	American Institute of Steel Construction	1	1	
Lifetime Achievement Award	International Association for Travel Behaviour Research	1	1	
Outstanding Career Centennial Road Safety Award	Transportation Association of Canada	1	1	
Sandford Fleming Award	Canadian Society for Civil Engineering	3	3	
Wason Medal for Meritorious Paper	American Concrete Institute	1	1	
Total		**24**	**24**	**100%**

Data Source: Awards & Honours Database (Office of Vice-President, Research and Innovation).

Note 1: Database includes records from 2014 to 2021 (data extracted Jan. 2022).

Note 2: Please note that the Research Awards and Honours database tracks prizes, awards and honours for research achievement, creative professional activity, and teaching or education received by faculty members during their appointment at University of Toronto. It does not include the following types of awards: salary awards (e.g. CRC, ERA); grants; fellowships at specific institutions; honorary or administrative positions in academic associations, societies or other universities; unelected fellowships or memberships in academic associations or societies.

Note 3: 'Number of Awards Won in the Dept' and 'Number of Awards Won at U of T' indicate the number of awards that exist in the OVPRI awards database that match both the specific award name and organization name within the timeframe indicated. This data is intended to provide an indication of the unit's share of a specific award in comparison to the UofT total.

Overall, 41% of our current faculty have received formal recognition for their achievements over the course of their careers, with more than 30% receiving major awards within the past five years (2018-2022). Additionally, approximately 38% currently hold named research designations (detailed within the following Research section of this report.) A comprehensive table summarizing the various professional awards and distinctions conferred on each of our faculty members since the Faculty began tracking this information in 2006 is available in appendix (App. C.6.)

In addition, over the past five years the Department has seen five of its key senior faculty electing to retire. These are Professors Emeriti Michael Collins, Doug Hooton, Brenda McCabe, and Frank Vecchio, and past Associate Professor Kim Pressnail. We would be remiss were we not to acknowledge the significant contribution these individuals, as well as Professor Emeritus Paul Young (retired 2010) have made to the Department, the University community, and the profession over the course of their stellar careers. To this end we include a companion piece to the above, highlighting the awards and distinctions conferred on these esteemed professors from 2006 until their respective retirement (App. C.7.)

4. RESEARCH

4.1 Preamble

The University's overarching and ongoing objective in research is to increase the institution's capacity to support and scale high-impact, interdisciplinary, strategic research initiatives that directly respond to today's most pressing societal challenges. Foremost in this is the imminence, and in many aspects the actual onset, of multiple levels of environmental crisis brought about through various types of human activity. The research community of the Civil and Mineral Engineering department is dedicated to exploring a range of pathways that will help lead our society toward a more sustainable future. Through our collective efforts in developing solutions to reduce our impact on the environment and protect human health, in examining and assessing manifold aspects of urban development and human movement toward identifying new approaches to create a more sustainable built environment, and in developing new materials and methodologies that align more compatibly with the natural world, our breadth of research has the intent and potential to significantly impact and help improve our communal path forward.

The importance and quality of research undertaken by our faculty researchers has received significant recognition. Of our complement of 42 faculty, sixteen (or roughly 38%) hold research honorifics, with six of our faculty holding Canada Research Chairs, two holding NSERC Industrial Research Chairs, another six hold named Chair designations, and three others hold named Professor designations.

4.2 Overview

Research is an evolving process, an ongoing cycle of discovery that seeks to reveal and respond to the aspirations and challenges presented to us through our shared experiences. Historically, in addressing these challenges investigators tended to work on a specific query independently, and generally within the confines of their select research group. However, as discovery in science has unfolded, so too has the nature of how research is conducted.

The research leaders of the Department of Civil & Mineral Engineering have long recognized that the most effective pathway to achieve a comprehensive understanding, and arrive at innovative, qualitative, and sustainable solutions, is through knowledge integration and collaborative consultation. As such, our collective approach to research over the past two decades has been largely collaborative in nature. Initially, these collaborations were most often conducted under the convention of a formally instituted offshoot centre or research cluster, solely sponsored by the Department. A few examples of these early research clusters are the Centre for Climate Science and Engineering, the Institute for Water Innovation, and the University of Toronto Transportation Research Institute (UTTRI). We will outline a few of the more recently established multidisciplinary research clusters that have stemmed from these earlier initiatives further in this chapter.

Collaboration is key to ensuring that all factors inherent to a given problem are assessed, considered, and incorporated into the creation of a workable solution, and to this end our outreach and partnerships with cognate departments, interdivisional initiatives, and industry partners assures that our research activities lead to qualitative progress and meaningful results.

The following presents a digest of the research currently underway within the Department, both via individual research groups and within large-scale collaborative efforts, to demonstrate how our research directions align with the University's commitment to Sustainability, and how our research output measures against peer institutions.

4.3 Thematic Research Areas

The range of research activities undertaken within the department is broadly encapsulated under five overarching thematic areas: Building Engineering, Environmental Engineering, Mining and Geomechanics, Structural Engineering, and Transportation Engineering and Planning. However, employing these five primary thematic areas does not intend to suggest that the breadth of our research is mutually exclusive of any other areas of investigation. Rather, the overall range of research undertaken within the department is categorized under these five themes for ease of cohesion. Within each of these primary themes there are several tertiary specializations that research groups branch out to, for example:

BUILDING ENGINEERING

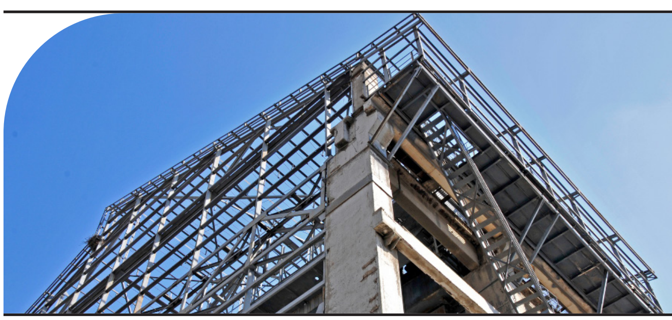
Building Science
Concrete Materials
Construction Management
Indoor Air Quality
Civil Informatics

ENVIRONMENTAL ENGINEERING

Drinking Water Treatment
Surface and Groundwater Remediation
Water Resources
Energy Resources
Sustainable Infrastructure

MINING AND GEOMECHANICS

Environmental Assessments
Mining Engineering and Mine Design
Rock Mechanics
Soil Mechanics



STRUCTURAL ENGINEERING

Assessment and Rehabilitation
Concrete Structures
Steel Structures
Timber Structures
Structural Dynamics and Earthquake Engineering
Sustainable Structures /New Construction Materials

TRANSPORTATION ENGINEERING AND PLANNING

Freight Transport
Intelligent Transportation Systems
Public Transportation Operations and Planning
Traffic-related Air Pollution/Urban Air Quality

4.4 Research Highlights

The majority of faculty members appointed to the Department of Civil & Mineral Engineering apply their expertise to more than one area of research specialization. A comprehensive list of our faculty members, grouped within their primary thematic research area and, where applicable, listing the sub-specialization areas their research and collaborative affiliations branch into is attached in Appendix D.

The following is a brief summary of the research currently underway in the department within each of the primary thematic research areas.

4.4.1 BUILDING ENGINEERING

Building engineering is concerned with the planning, design, construction, operation, renovation, and maintenance of buildings. This encompasses the exploration of all phases of the life cycle of a building as an advanced technological system, and brings into consideration the impacts of buildings on their surrounding environment, as well as the impacts of the surrounding environment on buildings. There are currently nine researchers aligned with this thematic area of the Civil and Mineral Engineering research portfolio: Tamer El-Diraby, Sarah Haines, Daeho Kim, Seungjae Lee, Ibrahim Ogunsanya, Daman Panesar, Karl Peterson, Jeffrey Siegel and Marianne Touchie.

Professor **Tamer El-Diraby** works in the general area of civil informatics. His primary focus is in developing new approaches to civil construction project management that is based on collaborative project knowledge. His work encompasses identification of community-based objectives, infrastructure asset management, development of smart city systems, and regenerative sustainability. Tapping into machine learning and other data management tools, and incorporating Building Information Modelling (BIM), semantic systems, and social network analysis, the software tools his research group develops serve to improve civic decision-making associated with large-scale construction projects.

Professor El-Diraby serves on the U of T President's Advisory Committee on Environment, Climate Change and Sustainability (CECCS): Teaching and Learning Sub-Committee, and is an affiliate of the University's Data Sciences Institute (DSI), the U of T Mobility Network, the U of T Transportation Research Institute (UTTRI), the Faculty's Centre for Analytics and Artificial Intelligence Engineering (CARTE), and the Institute for Sustainable Engineering (IES).

Professor **Sarah Haines** is presently concentrating her research in the area of building science with focus on indoor environmental quality, especially with respect to the analysis of indoor microbiome and the impacts of the built environment on human health. Utilizing cutting-edge microbiology techniques such as next-generation sequencing, metatranscriptomics, and bioinformatics, her work aids in understanding indoor air exposures from microorganisms and chemicals, providing for cleaner, more sustainable indoor environments.

A relatively new member of the Civil and Mineral Engineering department, Professor Haines currently serves as the collaborative project co-lead of the innovative "From Harvest to House" project, funded by the U of T Connaught Global Challenge Award (2022). The project seeks to develop a pathway to housing self-sufficiency in remote First Nations communities. Key project collaborators include researchers from the U of T departments of Anthropology, Health & Society, ISTEP/ILead, the Centre for Global Engineering (CGEN), TMU's Architectural Science program, and representatives from the First Nations communities of Prince Albert Grand Council, Cree Nation, Wahpeton Dakota Nation, and Montreal Lake Cree Nation.

Professor **Daeho Kim** is a very recent addition to the Civil and Mineral Engineering department, aligned within the general research area of construction management. He is currently in the process of developing his lab which, once up and running, will enable exploration of 3D reconstruction and digital twinning of ongoing construction projects. A key objective is to develop novel new training methodologies and programs to ensure the successful integration of cohesive human-robot collaboration in the construction process.

Professor **Seungjae Lee** also recently joined the CivMin department. His research is in the area of building science, with focus on the optimal design and operation of building energy systems. Proposing a new paradigm for the design and operation of buildings based on the seamless integration of building domain knowledge and big data, his goal is to create advanced solutions for construction design, operation, and maintenance that will help mitigate the impacts of climate change on the built environment, and improve quality of life through development of intelligent and interactive buildings.

Professor Lee is a collaborating researcher with the University's "Climate Positive Initiative", an affiliate of the U of T School of Cities, and the Faculty's Centre for Analytics and AI Engineering (CARTE).

Professor **Ibrahim Ogunsanya** joined the department in January 2022. Prior to embarking on his career in academia he enjoyed a multifaceted technical career spanning the fields of materials science, metallurgy, mechanical, civil, and chemical engineering. His research encompasses the study of metals and alloys, surface engineering and coatings, and cement and concrete chemistry, with particular focus on the durability and sustainability of reinforced structures. He employs a metallurgical and material science approach to proffer solutions to material durability and to address sustainability challenges in structural (on cement, concrete, and steel reinforcing alloys), nuclear (on concrete and metal alloys), and automotive (on lightweight alloys) engineering sectors.

Known for his work in the area of electrochemistry and corrosion, Professor Ogunsanya was recently elected to participate in the Metallurgy and Materials Society's Emerging Professionals (EP) Program, and earlier this year he received Professional Member status with the UK's Institute of Materials, Minerals & Mining, which recognizes the achievement of a level of experience or qualification within the materials, minerals and mining sectors. He is a member of the American Concrete Institute, the National Association of Corrosion Engineers (NACE) International, and the Minerals, Metals and Materials Society, USA chapter.

Professor **Daman Panesar** is an acclaimed specialist in the study of concrete. Her research activities are broadly focused in the investigation and development of new types of concrete materials. Her objectives are to improve the performance of concrete with an aim to reducing its environmental impact, and to extending the service life of structures and infrastructure. Her research outcomes are applied to underground, nuclear, transportation and building structures.

Examples of examinations undertaken to date include the study of low carbon footprint materials, nano-cellulose fibers, industrial by-products, and supplementary cementing material on the durability performance of concrete resulting from coupled degradation mechanisms.

Presently, Professor Panesar is the lead investigator in a large-scale partnership between the Canada Green Building Council and U of T to investigate new potentials through a project entitled "Burying Carbon in Buildings: Advancing Carbon Capture and Utilization in Cementitious Building Materials". Significant funding for this project is provided by Environment and Climate Change Canada's Climate Action and Awareness Fund.

Additionally, Professor Panesar is a collaborating member of the department's Seismic Resilience Group, an affiliate of the U of T's newly established Centre for the Sustainable Built Environment, a member of the Canadian Standards Association, the India-Canada Centre for Innovative Multidisciplinary Partnerships, and holds a professional affiliation as a cluster convener with RILEM's Technical Activities Committee (Cluster "A"). She also serves as an assistant editor of the publication *Cement and Concrete Composites* and as associate editor with the *Canadian Journal of Civil Engineering*.

In 2016 Professor Panesar was the inaugural recipient of the Erwin Edward Hart Professorship in Civil Engineering, a designation accorded in recognition of high-level research excellence and exemplary graduate student mentorship, a standing she has upheld throughout.

Professor **Karl Peterson's** research is dedicated to advancing the use of various microscopy techniques and x-ray tomography for analysis of concrete air void systems and microstructure. He is currently working with a number of agencies on methods for analysis of concrete microstructure, many of which are now using his automated concrete air-void analysis system. Professor Peterson serves on a number of ASTM International (formerly the American Society for Testing and Materials) committees.

Professor **Jeffrey Siegel** holds a Bahen/Tanenbaum Chair in Civil Engineering. His research is focused on the study of indoor air quality, addressing the most fundamental issues affecting the design of sustainable buildings. His work helps building planners and user groups to make informed decisions about energy use and indoor environmental health. The overarching aim of his research is to understand the transport, fate and control of indoor contaminants, and to utilize the analysis to develop a nuanced understanding of how buildings affect the indoor microbiome. This includes examination of the factors that lead to the proliferation of dangerous or pathogenic microorganisms, as well as those that lead to a healthy and diverse microbial community. The scope of his work in this field covers a vast range of research directions, and during the height of the COVID-19 pandemic Professor Siegel's counsel and research was central to informing public understanding of the pathways of transmission in indoor environments. Presently he is exploring the utilization of artificial intelligence and other forms of machine learning to analyze indoor environmental air quality.

Professor Siegel holds cross-appointments with the Dalla Lana School of Public Health and the Department of Physical & Environmental Sciences at UTSC. He is an affiliate of the University's Data Sciences Institute (DSI), the Faculty's Centre for Analytics and AI Engineering (CARTE), and is a Fellow of ASHRAE, a Member of the Academy of Fellows of ISIAQ, and a contributor to the OECD Forum Network.

Professor **Marianne Touchie's** research in the field of building engineering encompasses a wide-range of aspects of indoor environmental performance: building energy use, indoor environmental quality, thermal comfort, energy modeling, building environmental monitoring, building retrofits, occupant behavior, heat pump technology, and low-energy buildings. Much of her work has been central to understanding the interaction between energy performance and indoor environmental quality in Toronto's aging multiunit residential buildings, including a number of buildings used for social housing. Presently she is spearheading a collaborative project to assess the wellbeing and performance of a full range of buildings assembled on U of T's St. George campus, with the objective of utilizing the resulting data to establish a new framework for conducting future assessments of building and energy performance. The project is funded through the Faculty's "Dean's Strategic Fund" and includes collaborators from the Munk School of Global Affairs and Public Policy, the School of The Environment, Daniel's Faculty of Architecture, and the Dalla Lana School of Public Health.

Professor Touchie is jointly appointed to the Department of Mechanical & Industrial Engineering. She currently serves as a collaborating researcher with U of T's Climate Positive Initiative, is an affiliate of the U of T's Committee on the Environment, Climate Change and Sustainability (CECCS) with focus on urban issues, the U of T School of Cities, the Data Sciences Institute (DSI), and FASE's Centre for Analytics and AI Engineering (CARTE), Centre for Climate Science and Engineering (CSE), and Centre for Global Engineering (CGEN).

In 2022 Professor Touchie was the recipient of FASE's McCharles Prize for Early Career Research Distinction, as well as its Early Career Teaching Award, and in 2021 she received the Ontario Building Envelop Council's "Rising Star Award, Ontario Building Envelop Council 2021. She is a past president of the Building Science Specialist Board of Canada, and previously served as vice chair of ASHRAE's Technical Committee 2.1 on Physiology and Human Environment, and as academic director and chair of the Building Science Specialist of Ontario (BSSO) Committee for the Ontario Building Envelope Council (OBEC).

4.4.2 ENVIRONMENTAL ENGINEERING

Environmental Engineering is a wide-ranging branch of engineering concerned with the application of scientific and engineering principles to protect, improve and/or remediate our natural environment from the adverse effects resulting from both natural phenomena and human activities. It encompasses issues of public health as they pertain to water treatment, surface water and groundwater remediation, energy conservation, and environmental sustainability.

The group of researchers identifying with this theme comprise one of the largest collectives in the department, with ten principal investigators associating their work with this field. This includes professors Robert Andrews, Susan Andrews, Ron Hofmann, Bryan Karney, Heather MacLean, David Meyer, Elodie Passeport, Daniel Posen, Shoshanna Saxe, and Brent Sleep. Their research is generally categorized under six key areas: drinking water treatment, groundwater remediation, water resources, surface water, low impact development, and sustainable infrastructure.

A pressing research direction that has come to the fore among the Water research groups is the sampling and analysis of drinking and surface water to assess levels of microplastics and methods to remediate perfluoroalkyl and polyfluoroalkyl substances (PFAS). Their mutual investigations will lead to a clearer understanding of the cumulative affect of PFAS and microplastics on ecological and environmental health.

Professors **Robert Andrews**, **Ron Hofmann** and **Susan Andrews** work in close partnership under the umbrella of the Drinking Water Research Group (DWRG), which was founded in 1998 as a consortium of researchers from the U of T, Dalhousie and Indiana University Kokomo. Their U of T research hub is home to one of the most comprehensive water research laboratories in Canada, providing access to more than $3-million worth of analytical equipment that facilitates detection and monitoring of emerging contaminants.

Collectively, Professors Andrews, Hofmann, and Andrews conduct full-scale pilot research with industry partners, governments, and agencies around the world on water-related issues, ranging from microbial risk assessment, to photolysis-based advanced oxidation, testing the effectiveness of granular activated carbon and ferrate treatments, developing computer applications for improved water quality that generate lower environmental impacts and reduce economic costs, and developing advanced water treatment technologies for use in resource-limited and drought-ridden regions. Currently, their research directions have expanded to include the study of microplastics in drinking waters, inactivation of emerging pathogens, and disinfection of reuse waters.

Professor Bob Andrews held the NSERC Industrial Research Chair in Drinking Water Treatment and Professor Ron Hofmann held the NSERC Industrial Research Associate Chair in Drinking Water Treatment from 2007 to 2022. This pair of Industrial Research Chairs had matching funding from a consortium of eight municipalities and other government agencies. With the termination of the Industrial Research Chair program by NSERC, Professors Andrews and Hofmann have extended the government support to match an NSERC Alliance grant.

Professor Hofmann was the President of the International Ultraviolet Association for 2020-2022, and is now the Past-President. He also served as the Acting Director of the University's Institute for Water Innovation in 2021. He received the Ontario Water Works Association 2021 Norman J. Howard Award, in recognition of "outstanding contributions to research in municipal water supply" (May 2021) and the Ontario Water Works Association 2022 George Warren Fuller Award, in recognition of "sound engineering skill, brilliant diplomatic talent, and constructive leadership" in municipal water supply.

Professor Susan Andrews is a member of the Ontario Drinking Water Advisory Council, the Project Advisory Committee (PAC) for Water Research Foundation Project, and the American Water Works Association (AWWA) Organic Chloramine Subcommittee.

All three researchers are also affiliated with the Faculty's Institute for Water Innovation, an interdisciplinary research cluster dedicated to developing innovations in water management, chemistry, water treatment, and remediation.

Professor **Bryan Karney** places his research focus in the design, analysis, operation and optimization of various water resource and energy systems. Particular areas of specialization include the design and analysis of water distribution systems and pipe networks (including physical and chemical characteristics), factors impacting infrastructure renewal, transient event and water hammer analysis, and system optimization. This partners with his overarching interests in development of sustainable infrastructure, examining the implications of climate change to system design and performance, and assessment of energy use.

Utilizing emergent methodologies such as low impact development, and newer sensor technologies for advanced performance monitoring, he seeks to move engineering knowledge beyond the static models conventionally used for evaluating the sustainability of systems. His expertise has attracted consultancy relationships with several municipalities, such as the City of Toronto (GTHA) and the Region of Peel, and his input has been invited on a number of major projects, for example the hydraulic analysis of the Western Beaches Project, and a hydraulic review of the Pearson International Airport jet fuel distribution system.

Professor Karney is cross-appointed to the Faculty's Institute for Studies in Transdisciplinary Education in Engineering and Practice (ISTEP), he is a collaborating researcher with U of T's Climate Positive Initiative, an affiliate of the U of T School of Cities, and of FASE's Institute for Sustainable Energy, Centre for Resilience of Critical Infrastructure, and Institute for Water Innovation (IWI). He also served as the Faculty's Associate Dean – Cross Disciplinary Programs from July, 2009 to June, 2021.

Professor **Heather MacLean** is the Tier 1 Canada Research Chair in Sustainable Systems and Technology Assessment. Her research directions include sustainability, life-cycle assessments for energy and transportation technologies, and the built environment. A well recognized researcher in the field of environmental engineering, her work spans applications to greenhouse gas emission reduction, transportation, infrastructure, and sustainable cities. Her approach is widely interdisciplinary, incorporating environmental, civil, chemical and mechanical engineering, economics, and public policy components.

A sampling of the topical areas she has explored include development of bioenergy systems, for example bio-based electricity and liquid fuels (ethanol, hydrogen, and aviation fuels), the design of conventional and alternative light-duty and medium-duty vehicles, the study of conventional and unconventional fossil fuels, and considerations for the creation of sustainable and resilient cities and sustainable infrastructure.

Professor MacLean currently serves as FASE's Vice-Dean - Strategy. She is cross-appointed to the Faculty's Institute for Transdisciplinary Engineering Education and Practice (ISTEP), is co-research director of the Sustainable Systems Research Group, and a collaborating researcher with the U of T Climate Positive Initiative. She is also an affiliate of the U of T's Committee on the Environment, Climate Change and Sustainability (CECCS): Environment section, the Centre for the Sustainable Built Environment, the U of T Mobility Network, and the U of T School of Cities. Within the Faculty she is an affiliate of the Centre for Analytics and AI Engineering (CARTE), the Institute for Sustainable Energy, and the Lassonde Institute of Mining. She is a Fellow of the Canadian Academy of Engineering, and the Engineering Institute of Canada.

Professor **David Meyer** joined the CivMin department in 2019. His research focuses on urban water distribution networks, particularly those within developing nation mega-scale city environments (such as Delhi, India), and the intermittent water systems that are most often utilized in underdeveloped countries, in particular those located in the Global South, which have led to several studies and projects examining new ways of understanding, sensing, managing and modelling water networks. An overarching objective of Professor Meyer's research is to change the efficacy of water and sanitation on a global scale. Working within multi-disciplinary collaborative research teams, and incorporating Artificial Intelligence and other machine learning tools to invent new data science methodologies that aid big data collection and analytics, his work has drawn recognition and support from within the University and internationally.

Professor Meyer is the Edwin Hart Professor in Global Engineering. He is jointly appointed to the Institute of Studies in Transdisciplinary Engineering (ISTEP), and is affiliated with the University's Data Sciences Institute (DSI), and the Faculty's Centre for Global Engineering (CGEN), the Institute for Water Innovation (IWI), and the Centre for Analytics and AI Engineering (CARTE).

Professor **Elodie Passeport** is the Tier 2 Canada Research Chair in Environmental Engineering and Stable Isotopes. Her research involves developing analytical tools based on stable isotopes to study the behavior of organic chemicals in surface water environments, such as rivers and lakes. Her research context spans contaminated groundwater, wastewaters, industrial and agricultural effluents, to radiological pollution.

Presently her research investigations are focused in the fate and removal of emerging contaminants, in particular microplastics, from the environment in both natural and engineered systems. Working in collaboration with Electrical and Computer Engineering professor Joshua Taylor, and incorporating machine learning and optimization into the data analysis process, they have established a prediction model that bypasses classical quantification methods (which are labour intensive and often deliver inaccurate results), making the process of counting and classifying microplastics easier, faster, and more affordable.

Another collaboration, involving a multidisciplinary, multi-institutional group of researchers from U of T, Windsor, Trent, and Western Universities, scientists from Environment Canada, the Ontario Ministry of Environment (Conservation and Parks), and the Toronto Region Conservation Authority, and industrial partner Wilson Analytical, the group is working to develop advanced new tools to test, analyze and track microplastics pollution. Their project, entitled "Source-specific Identification Characterization and Control of Microplastics across a Remote, Rural and Urban Gradient", is funded under NSERC and Environment and Climate Change Canada's "Plastics Science for A Cleaner Future" program.

Professor Passeport is jointly appointed to the Department of Chemical Engineering and Applied Chemistry and is an affiliate of the Faculty's Institute for Water Innovation (IWI). She is a recipient of the Ontario government's Early Research Award (2021), and in 2020 she was awarded FASE's Early Career Teaching Award.

Professor **Daniel Posen** is the Tier 2 Canada Research Chair in System-Scale Environmental Impacts of Energy and Transport Technologies. His research focus in system-scale environmental sustainability analysis draws on a range of tools from engineering, science, economics, and public policy to provide quantitative analyses that serves to guide environmental policy and decision-making. His research approach is rooted in data management and life-cycle assessment, applied to analyze the sustainability of various technology systems such as alternative fuels and electric vehicles.

Professor Posen is cross-appointed to the Institute for Studies in Transdisciplinary Engineering (ISTEP). He is a collaborating researcher with the U of T's Climate Positive Initiative and co-research director of FASE's Sustainable Systems Research Group, an affiliate of the U of T Centre for the Sustainable Building Environment, the U of T Mobility Network, and FASE's Centre for Climate Science and Engineering (CSE), Centre for Analytics and AI Engineering (CARTE), Centre for Resilience of Critical Infrastructure, and the Lassonde Institute of Mining. Presently he is also serving as a member of the executive committee planning the International Symposium on Sustainable Systems and Technology Conference, scheduled to take place in June, 2023.

Professor **Shoshanna Saxe** is the Tier 2 Canada Research Chair in Sustainable Infrastructure. Her current research focuses on how urban infrastructure impacts the environment, how the materials we use to build our communities embody greenhouse gases, how our construction practices contribute to our environmental challenges, and how we as a society interact with and shape our built environment.

An expert in life cycle analysis of infrastructure systems and inherent construction materials, Professor Saxe identifies herself as an infrastructure engineer. Her research approach incorporates inter and multidisciplinary investigations, and her objective is to apply her research findings toward developing new approaches to city building. Her intent is to help engineers and developers in designing greener buildings, and to encourage the inception of urban planning policies that will support the concepts of sustainable infrastructure.

Professor Saxe is the Co-Research Director of the Sustainable Systems Research Group, a collaborating researcher with the U of T's Climate Positive Initiative, and an affiliate of the University's Committee on the Environment, Climate Change and Sustainability (CECCS): Urban Issues, the Data Sciences Institute (DSI), the Mobility Network, and the School of Cities. She is a member of the Steering Committee for FASE's Centre for Analytics and AI Engineering (CARTE), and currently serves on Waterfront Toronto's Capital Review Panel, and Metrolinx's Project Evaluation Advisory Panel. She is a founding member of the FASE Centre for the Sustainable Built Environment.

Professor **Brent Sleep** dedicates his research toward the development of innovative methods for remediation of soil and groundwater contamination, with focus on the study of organic contaminants such as hydrocarbons, chlorinated compounds, and per-and polyfluoroalkyl substances. By combining laboratory testing with computer modelling to analyze and assess the effectiveness of a range of processes, such as bioremediation, thermal remediation, and the application of chemical oxidants, his work seeks to understand the fate and transport of organic chemicals in both subsurface and groundwater environments.

Professor Sleep has served as Chair of the Department of Civil & Mineral Engineering since July, 2013. His current term will conclude in June 2023. He is also director of the department's Master of Engineering in Cities Engineering and Management (MEngCEM) program, an affiliate of FASE's Institute for Water Innovation (IWI), the Lassonde Institute of Mining, and is a Fellow of the Engineering Institute of Canada and the Canadian Society for Civil Engineering. In his capacity as chair of the department he also serves as the U of T representative with the Canadian Society for Civil Engineering. He is a past editor-in-chief for the Journal of Contaminant Hydrology and associate editor for the journal Advances in Water Resources.

4.4.3 MINING and GEOMECHANICS

Geomechanics is concerned with the behaviour of soil from a small scale to a landslide scale, and with rock mass characterization and rock mass mechanics, usually as applied to the petroleum, mining, and construction industries. The breadth of research undertaken by the eight researchers associated with the department's Mining and Geomechanics group is both impressive and comprehensive. Their collective research foci spans mechanics and geometry of fractured rock masses, engineering design of rock masses, laboratory study of dynamic earthquake ruptures, the dynamic response of materials under elevated temperature, failure analysis of composites, mechanical properties of multiphase granular materials, and smart materials for sensor technology.

The researchers associated with the Mining and Geomechanics theme consist of Professors Kamran Esmaelli, Mason Ghafghazi, Sebastian Goodfellow, Murray Grabinsky, Giovanni Grasselli, John Hadjigeorgiou, John Harrison, and Lesley Warren.

Professor **Kamran Esmaeili** holds the Robert Smith Chair in Geomechanical Mine Design and Analysis and leads the research undertaken in the Mine Modeling and Analytics lab. He is particularly interested in data analytics and machine learning as applied to mining and geoscience, and his work strives to explore the development of predictive analytics and smart modeling solutions that will allow better mine design, continuous mining process control, and optimization within the mining industry. Current investigations include the application of unmanned aerial vehicle (UAV) technology for real-time collection of mining data, the development of a mobile multi-sensor core logging facility, the characterization of the effect of micro and macro heterogeneity of rock on its comminution behaviour, the quantification of blasting parameters and relationship to heterogeneous and anisotropic nature of jointed rock masses, and the development of spatial numerical models for reliable pit slope design.

Professor Esmaeili is an affiliate of FASE's Centre for Analytics and AI Engineering (CARTE) and the Lassonde Institute of Mining, and is an adjunct faculty member with the Department of Earth & Environmental Sciences at the University of Waterloo. He also collaborates with researchers from the Department of Geomatics Science at Laval University, and the Department of Civil Engineering at the University of Johannesburg, South Africa. Industry collaborators include Kinross, McEwen Mining, Arcelor Mittal, Weir, and Golder.

Professor **Mason Ghafghazi** specializes in the area of geotechnical engineering, applied to addressing a range of issues of concern within the mining industry. Using a variety of methods, for example advanced laboratory element testing, large scale testing, and constitutive and numerical modelling, his work seeks to accurately identify the characteristics of non-classic geomaterials (such as widely graded gravelly quartz sands, plastic clay, mine tailings, and silts), and to establish a clear understanding of the fundamental behaviour of these materials to predict their response under load, especially under conditions of extreme events such as storms, floods and earthquakes.

Professor Ghafghazi currently serves on the Department's Undergraduate Studies Committee, and is an affiliate of the Lassonde Institute of Mining.

Professor **Sebastian Goodfellow** is a geophysicist and engineer who is applying his specialization in seismology, and his extensive expertise in the areas of data analytics, machine learning, computer programming, mathematical modelling, and design, to further research in a number of unconventional applications. His approach to research is interdependent, drawing in information and factors from a wide range of sources. As such he works in close collaboration with a number of inter- and transdisciplinary research teams.

For example, he is currently working with an expert team at the Hospital for Sick Children's Laussen Labs, contributing his proficiency in engineering, computer science and digital signal processing to help build and deploy a model that will detect and diagnose common pediatric heart arrhythmias using continuous ECG data. The objective is to incorporate artificial intelligence into data analysis to enhance and speed up detection, thus helping physicians to make more timely diagnostic decisions. His work in partnership with Laussen Labs is also leading to development of a more generalizable solution to address the translation gap in AI for health care.

At the other end of his research spectrum he is combining machine learning and data science with rock mechanics to develop new techniques in seismic data analysis. The aim is to better understand the key processes that lead to induced earthquakes, an area of particular interest to a number of industries, for example those involved in geothermal power, hydraulic fracturing and carbon sequestration.

Professor Goodfellow is an affiliate of the U of T's Data Sciences Institute (DSI), the Faculty's Centre for Analytics and AI Engineering (CARTE), and the Lassonde Institute of Mining. As noted above, he is also a senior research associate with the Hospital for Sick Children's Laussen Labs.

Professor **Murray Grabinsky** dedicates his research to experimenting with the conversion of mine tailings to Cemented Paste Backfill (CPB) for more efficient and safe handling of waste material generated during the mining process. The CPB is produced through liquefaction of the mine tailings mixed with a binder. His research investigations are rooted in aiding the development of sustainable infrastructure, and go beyond the traditional areas of liquefaction research to explore innovative new areas, such as the effects of binder hydration, sustained high frequency loading, heterogeneous in-situ conditions, and the use of rheology. His work is conducted in partnership with mining companies that produce large quantities of tailings, and has led his fieldwork to examine mines located in Canada, South America and Africa. His fieldwork is complemented by the development and application of numerical models and laboratory testing conducted within the unique facilities he has developed to accommodate CPB research.

Professor Grabinsky is affiliated with the Institute for Water Innovation (IWI) and the Lassonde Institute of Mining.

Professor **Giovanni Grasselli** is the NSERC Energi Simulation Industrial Research Chair in Fundamental Rock Physics and Rock Mechanics. Prior to this he was the inaugural holder of the NSERC-Foundation CMG Industrial Research Chair in Fundamental Petroleum Rock Physics and Rock Mechanics. His research is concentrated in the development of new technologies, such as hybrid finite-discrete element (FDEM) numerical method and experimental visualization techniques to identify and assess unconventional approaches to petroleum production, which in turn could help to reduce the environmental impacts of hydraulic fracturing.

Through his association with Energi Simulation he collaborates widely with researchers from around the world, and in 2022 he chaired a global workshop to discuss the evolution of the finite-discrete element method from its beginnings to the latest advancements, with an aim to bridging the gap in knowledge translation between industry and academia. Earlier that year he also worked in partnership with NSERC and the Canadian Society for Unconventional Resources (CSUR) to host a workshop to discuss considerations for the geological storage of carbon dioxide, hydrogen and compressed air.

Professor Grasselli received the Canadian Geotechnical Society's John A. Franklin Award in Rock Mechanics in recognition of his work in 2019. He is an affiliate of FASE's Lassonde Institute of Mining.

Professor **John Hadjigeorgiou** holds the Pierre Lassonde Chair in Mining Engineering. He specializes in the areas of rock characterization, slope stability, tunnelling, reinforcement and support, and mine design. His current research is focused in geotechnical pit design and managing risk in open pit mines (particularly in the Canadian Arctic and South Africa), the characterization of veined rock masses and understanding their behaviour under load, and on the behaviour of rock reinforcement to quantify performance under extreme conditions of large deformations, mining induced seismicity, and in corrosive environments. He has worked on surface and underground mining projects around the globe, and serves as a consultant to a number of major mining companies, advising on the management of mining risk and its impact on operations.

Professor Hadjigeorgiou is an affiliate of the Lassonde Institute of Mining, a Fellow of the Canadian Institute of Mining, Metallurgy and Petroleum, and a member of the board of directors at Troilus Gold Corporation.

Professor **John Harrison** holds the W.M. Keck Chair in Engineering Rock Mechanics. His research interests are focused in examining the unpredictability of the properties of fractured rock masses, particularly with regard to rock engineering design. Partner to this is his interest in the formation of reliability-based design standards for geotechnical engineering and rock mechanics that can be universally applied to mine sites throughout the world. To this end, in 2022 Professor Harrison received the 22nd Glossop Medal, awarded by the Engineering Group of the Geological Society (UK) in recognition of his work to incorporate rock engineering into the second generation of Eurocode 7 – the European Committee for Standardisation's specifications for how geotechnical design should be conducted within Europe. The code is now considered as a standard for geotechnical design worldwide.

Professor Harrison currently serves as the department's Associate Chair, Undergraduate Studies – Lassonde Mineral Engineering program, and is an affiliate of the Lassonde Institute of Mining.

Professor **Lesley Warren** holds the Claudette MacKay-Lassonde Chair in Mineral Engineering, and serves as the director of the Lassonde Institute of Mining. She is an applied scientist who combines geochemistry with molecular and experimental microbiology to identify the processes that affect water quality and reclamation efficacy. Of particular note are her current research investigations to identify the microbes that occur in mine waste and impacted waters, with emphasis placed on the examination of the genetic sequence of the bacteria and bacteriophages (phages) present in mine wastewater. Her objective is to better understand how bacteriophages drive changes in water quality or waste stability. Discoveries from this research direction are leading to the development of new models and technological tools to help inform and enhance environmental practices within the mining industry.

Professor Warren's innovative work in this area has led to creation of the "Mining Wastewater Solutions Project" (MWS Project), a large-scale international collaboration funded by Genome Canada, Ontario Genomics, Genome Quebec, Ontario Government (MRI, ORF-RE program) and several industry partners, including Glencore Sudbury INO, Hudbay Minerals, and Rambler Metals and Mining. Led by Professor Warren, the project involves researchers from the University of California, Université de Montréal, and the Commonwealth Scientific and Industrial Research Organization. Research industry partners include Ecoreg Solutions and Ecometrix consulting companies, the Mining Association of Canada (MAC), the Ontario Mining Association (OMA), and the Mine Environment Neutral Drainage (MEND) program.

Professor Warren is also an affiliate of FASE's Institute for Water Innovation.

4.4.4 STRUCTURAL ENGINEERING

Structural engineers are responsible for engineering design and structural analysis, with practitioners most often specializing in a particular area of structures such as bridge or building engineering, or mega-urban and/or industrial structures. In the Department of Civil & Mineral Engineering, research investigation in structural engineering is more broadly encompassed under seven key sub-categories: assessment and rehabilitation, bridge design, concrete structures, infrastructure and critical infrastructure resilience, seismic resilience, steel structures, structural dynamics and earthquake engineering, and timber structures. The nine principal investigators in the department currently working within this field are Fae Azhari, Evan Bentz, Constantin Christopoulos, D. Paul Gauvreau, Oh-Sung Kwon, Oya Mercan, Jeffrey Packer, Aryan Rezaei Rad, and Shamim Sheikh.

Professor **Fae Azhari** places her research focus in three relational directions: the design and development of novel smart sensing devices to accurately monitor the behaviour of structures and provide continuous data on their current conditions; adapting and integrating commercially available sensors to create smart systems; and, developing decision-making frameworks to translate data collected from sensors into efficient, remedial and functional strategies for engineering structures. As an example, her work in the design and development of smart sensors resulted in the creation of a concrete sensor that integrates conductive carbon fibers and nanotubes into concrete, making it a self-sensing material. From 2018 to 2021 Professor Azhari held one of the FASE Dean's Spark Professorships, conferred in support of her work assessing the performance of structures using Structural Health Monitoring (SHM) techniques to amplify global efforts for resilient and sustainable structures.

Most recently, Professor Azhari has expanded her research focus to study the potential of wearable sensors to aid the assessment of in-socket conditions of lower limb prosthesis users, with an aim to improve gait monitoring and rehabilitation. Working in collaboration with Professor Mark Kortschot (MIE) she is also experimenting with new methods for fabricating prosthetic sockets to improve their function and enhance the comfort of lower limb amputees who use protheses.

Professor Azhari is jointly appointed to the Department of Mechanical & Industrial Engineering and is an affiliate of FASE's Centre for Analytics and AI Engineering (CARTE).

Professor **Evan Bentz** is an expert in the development of structural software. His research seeks to address the problem of how engineers can use new approaches in design to better assess and repair structures before catastrophe strikes. To address this, to date he has written the technical software programs Response, Membrane-2000 and Triax-2000, and the companion analysis tool Augustus-II.

Response is an easy to use sectional analysis program that will calculate the strength and ductility of reinforced concrete structures subjected to sheer, moment, and axial load. The program is freely available online (https://www.hadrianworks.com) and thus far it has been downloaded by 95,000 engineers and researchers in 159 countries. The software has helped revolutionize building codes across Canada, the United States and Europe.

Membrane-2000 generates a detailed look at a single element of a shell, and Triax-2000 considers a single triaxial element. Augustus-II combines the strengths of VecTor2 for modelling of walls with the speed of Response for analysis of beam and column elements.

Professor Bentz currently serves the department as Associate Chair-Undergraduate Studies, Civil Engineering program. He is a research collaborator in CivMin's Seismic Resilience Group, FASE's Centre for Resilience of Critical Infrastructure, and an affiliate of the U of T's Committee on the Environment, Climate Change and Sustainability (CECCS), and Centre for the Sustainable Built Environment.

Professor **Constantin Christopoulos** holds the Tier 2 Canada Research Chair in Seismic Resilience. His primary research focus is placed on the development of advanced high-performance structural systems that enhance the dynamic response and seismic resilience of built infrastructure. A leading expert in seismic isolation and supplemental damping devices, his early work led to the development of the Viscoelastic Coupling Damper (VCD), an award-winning technology that helps control wind-induced and earthquake-induced dynamic vibrations in tall structures, widely used throughout the building industry today.

In addition to his research and teaching activities, Professor Christopoulos is also leading a major retrofit infrastructure project in the department which, upon completion, will introduce a suite of new state-of-the-art tools and equipment to the department's Structural Testing Facility. The centrepiece of this new development will be the installation of the world's first fully movable, adjustable, multidirectional, large-scale and large-capacity loading frame. The project is being funded via CFI's Innovation Fund 2020.

Professor Christopoulos is the author of numerous technical papers and two predominant textbooks. He is the co-inventor on several international patents and is a co-founder of U of T spinoff companies Cast Connex, which specializes in cast steel connections and casting design, and Kinetica Dynamics, which markets the viscoelastic coupling damper for high-rise buildings. He currently serves as a technical advisor to Kinetica and more widely as a consultant on a sizable number of projects involving the implementation of advanced damping and isolation technologies. He is a collaborator in the CivMin Seismic Resilience Group, an affiliate of FASE's Centre for Resilience of Critical Infrastructure, and Centre for Global Engineering (CGEN), and is a contributor to the Council on Tall Buildings and Urban Habitat (CTBUH).

Professor **Paul Gauvreau** specializes in bridge design. His research is centered in the development of new bridge systems that make efficient use of new materials such as high-strength concrete, emerging reinforcement materials, and innovative wood products. With emphasis on sustainable bridge design, bridge aesthetics, and the development of simple, rational models for visualizing the flow of forces in reinforced and pre-stressed concrete structures, his research findings serve to validate new bridge designs and building materials that use fewer, more highly developed technological substances. Recent investigations include a qualitative study of the efficiency of post-tensioned bridges, and development of a modular timber/concrete composite system for short-span highway bridges.

Professor Gauvreau is a former NSERC Chair in Design Engineering. He is an affiliate of FASE's Centre for Analytics and AI Engineering (CARTE), and he continues to provide consulting services to a range of stakeholders, such as the Ministry of Transportation of Ontario, Ministere des transports du Quebec, and a number of industrial partners (i.e., Earth Tech Inc, McCormick Rankin Corp., BPR Inc.)

Professor **Oh-Sung Kwon** specializes in the areas of earthquake engineering and seismic soil-structure interaction, with focus on developing and applying advanced, integrated, simulation techniques to assess complex structural systems. His investigations incorporate hybrid techniques that combine numerical models and experimental specimens to determine how structures respond to extreme loads such as earthquake, wind, and fire. Presently, he is working on developing a framework and algorithms to advance the integrated simulation approach, and creating a companion software program that will aid the integration of various numerical analysis tools in order to improve accuracy in the prediction of the dynamic response of a structural system. His research group is one of the first in the world that has explored hybrid fire simulation and hybrid wind simulation.

Professor Kwon is a collaborator in the department's Seismic Resilience Group, and an affiliate of the Faculty's Centre for Resilience of Critical Infrastructure Centre, and Centre for Analytics and AI Engineering (CARTE).

Professor **Oya Mercan** places her research focus on developing and implementing real-time testing methods that couple computer simulation and physical testing to investigate the dynamic behaviour of complex structures, particularly structural dynamics under conditions correlated to climate change. Experimenting with a myriad of algorithms, her research group has developed a simulation framework that can seamlessly integrate numerical models in several analysis platforms. Further development of this advanced simulation framework will make it possible to generate a regional scale simulation that can help evaluate the resilience of urban infrastructure under extreme conditions.

Working in partnership with educators from the University's Department of Physical and Environmental Sciences, Professor Mercan is also currently leading an innovative project to develop a transdisciplinary program that will allow engineering and climate science students to study climate-related stress on infrastructure. The initiative has received significant funding from eCampusOntario, a not-for-profit centre of excellence in teaching and learning through technology.

Professor Mercan is the Edwin Hart Professor of Civil and Mineral Engineering, a distinction she has held since 2016. She is the director of the Centre for Climate Science and Engineering, a collaborator with the department's Seismic Resilience group, FASE's Centre for Resilience of Critical Infrastructure, a collaborating researcher with the University's Climate Positive Initiative, and an affiliate of the U of T School of Cities. She is a member of the Elsevier Engineering Structures Early Career Editorial Board, and presently serves as executive editor of the Journal of Steel Structures & Construction.

Professor **Jeffrey Packer** is a well recognized international expert and leading scholar in the field of structural engineering design and construction, especially as pertains to tubular steel structures. His research interests and body of work span the full scope of investigative areas, from examination of static, fatigue, impact, blast and seismic behaviour of steel Hollow Structure Section members, to articulation and publication of manufacturing standards and design specifications for all types of hollow section. In recognition of his significant contribution to the Canadian steel construction industry Professor Packer received the Alfred F. Wong Lifetime Achievement Award from the Canadian Institute of Steel Construction in 2022.

A former Bahen/Tanenbaum Chair in Civil Engineering, Professor Packer continues to further his work both within academia and industry. Within academia his investigations have led to collaborations with researchers from around the world, including Ecole Polytechnique Montreal, the Karlsruhe Institute of Technology (Germany), Delft University of Technology (Netherlands), Monash University (Australia), Nanyang Technological University (Singapore), National University of Singapore, and the Israel Institute of Technology. Professor Packer is an affiliate of the Faculty's Centre for Resilience of Critical Infrastructure. He is currently bringing his expertise to collaborative investigations generated within the department's newly established Seismic Resilience Group.

Within industry Professor Packer serves on a number of technical committees, such as the American Institute of Steel Construction, the American Welding Society, the Canadian Standards Association, the International Institute of Welding, the Steel Tube Institute, and the International Committee for the Development and Study of Tubular Construction.

Professor **Aryan Rezaei Rad** joined the department in January, 2023. His expertise and research interests lie in the design of sustainable structural systems, and the integration of advanced computational methods and digital technologies into structural systems design. He is especially interested in the use of bio-sourced materials, such as timber, in structural systems.

As he builds his research program at U of T Professor Rezaei Rad is focussing on the development of new design frameworks and principles for sustainable structural systems, the creation of computational packages and open-source software to facilitate structural engineering design, and experimentation and development of emerging digital fabrication technologies (i.e., robotic/CNC machinery, new building geometry and design of assemblies.)

Professor Rezaei Rad is an alumnus of Ecole Polytechnique Federal de Lausanne (EPFL) and has enjoyed post-doctoral research collaborations with scientists at the Swiss National Science Foundation's National Centre for Competence in Research Digital Fabrication (SNSF-NCRR). He is a civil engineer member of the Swiss Society of Engineers and Architects (SIA).

Professor **Shamim Sheikh** is invested in the study of seismic resistance of concrete structures, and the use of fiber reinforced polymers as a replacement for steel to develop corrosion-free concrete structures. His ongoing work has led to the development of improved design procedures and new materials to produce more resilient infrastructure.

Professor Sheikh is a Fellow of the Canadian Academy of Engineering, and recently was invited to speak in the Distinguished Webinar Series in Earthquake Engineering and Seismology, organized by the Canadian Association of Earthquake Engineering. He has authored a substantial number of research papers in the areas of seismic resistance of concrete structures, development of corrosion-free sustainable infrastructure, and the effects of climate change on structures. He is also a co-author of several design Codes and Standards and Material Specifications. His body of work has attracted recognition and awards both within Canada and through to the United States, Japan, China and Pakistan.

4.4.5 TRANSPORTATION ENGINEERING and PLANNING

Transportation Engineering and Planning at U of T combines scientific analysis and the use of technology to inform the planning, functional design, operation and management of transportation infrastructure and monitoring systems. There are six lead researchers dedicated to this area of investigation: Baher Abdulhai, Khandker Nurul Habib, Marianne Hatzopoulou, Eric Miller, Matthew Roorda, and Amer Shalaby. They work collectively and collaboratively under the umbrella of the University of Toronto Transportation Research Institute (UTTRI) and its affiliated research clusters.

Professor **Baher Abdulhai** focuses his research on the modeling and simulation of large-scale dynamic transportation networks, which in turn serves to inform development of intelligent transportation systems (ITS). Helping to reduce gridlock and better manage traffic congestion in large urban areas, his work has led to the creation of two patented intelligent transportation traffic signal control systems: MARLIN, a machine-learning-based control software system for self-optimized traffic lights, and MiND, an ITS that considers both traffic and public transit to minimize delays for all users. Both systems have been licensed by major technology firms.

Keenly interested in incorporating emerging technologies to arrive at new, more sustainable, traffic management solutions, Professor Abdulhai is co-director of UTTRI's Centre for Automated and Transformative Transportation Systems (CATTS), an affiliate of the U of T's Committee on the Environment, Climate Change and Sustainability (CECCS), the U of T Mobility Network, the Data Sciences Institute (DSI), and the Faculty's Centre for Analytics and AI Engineering. In 2020 he was welcomed as a Fellow of the Canadian Academy of Engineering, and in 2021 he received the Ontario Professional Engineers Awards' Medal for Engineering Excellence.

Professor **Marianne Hatzopoulou** is the Tier 1 Canada Research Chair in Transport Decarbonization and Air Quality. Her research interests lie in capturing the interactions between the daily activities and travel patterns of urban dwellers, and the generation and dispersion of traffic emissions in urban environments. Her efforts in developing new technologies, such as micro and mobile sensors, is changing the way air pollution is being monitored and mapped in urban areas, and her work has resulted in the generation of GHG emission inventories for several municipalities.

Professor Hatzopoulou is the Director of FASE's Positive Zero Transport Futures initiative, mandated to explore, test, and implement transportation innovations that will achieve low to zero emissions, while bearing positive health and social impacts. Her substantive work in this field carries through to her involvement as Head of the Air Quality Group for U of T's Data Sciences Institute: Research and Academics Committee, and as a collaborating researcher with the University's Climate Positive Initiative. She is a research leader with FASE's Centre for Automated and Transformative Transportation Systems (CATTS) and the City Logistics for the Urban Economy (CLUE) initiative, and an affiliate of the Centre for Climate Science and Engineering, the U of T Mobility Network, and the School of Cities. In addition, she leads the Transportation and Air Quality (TRAQ) research group, is a professional affiliate of the GTHA Smart Freight Centre, and a contributor to the OECD Forum Network.

In her capacity as director of the Positive Zero Transport Futures Initiative, and working in partnership with Professor Eric Miller of the University's Mobility Network, she is also serving as chair of the Emerging Mobility Scholars Conference, scheduled to take place in June, 2023.

Professor Hatzopoulou also currently serves as the department's Associate Chair – Graduate Studies[1].

Professor **Eric Miller** is well recognized as both a pioneer and a highly regarded change agent in the field of transport modelling, the development and application of microsimulation modelling systems within large urban contexts, and transportation land use systems analysis with focus on sustainable urban design. His leadership responsibilities and collaborative affiliations are varied and vast.

As founder and director of the University of Toronto Transportation Research Institute (UTTRI) he instituted two offshoot research and service clusters: the Data Management Group (DMG) and the Travel Modelling Group (TMG). The DMG provides data and modelling services to inform analysis of travel behaviour. The TMG provides a forum and mechanism for inter-agency collaboration. These initiatives were the forerunners that led to the establishment of the broadly-based collaborative initiative now assembled under the U of T Mobility Network.

A significant output of his work is the development of the Integrated Land Use, Transportation, Environment (ILUTE) modelling system, a multi-year, multi-university undertaking that involved researchers from Calgary, Laval and McMaster Universities. The system incorporates state-of-the-art object-oriented programming methods, development and implementation of a wide variety of behavioural sub-models, and use of a variety of novel data collection procedures to obtain dynamic and micro-level behavioural data.

Professor Miller is the current director of the U of T Mobility Network, a research director for the affiliated Data Management Group, a lead researcher at the Centre for Automated and Transformative Transportation Systems (CATTS), and a collaborating researcher with U of T's Climate Positive Initiative. He is an affiliate of the University's Committee on the Environment, Climate Change and Sustainability (CECCS) - Urban Issues section, the U of T School of Cities, FASE's Centre for Resilience of Critical Infrastructure, and is a contributor to the National Research Council's Energy Modelling Initiative. He is past chair of the U.S. Transportation Research Board (TRB) Committee on Travel Behavior and Values, a Member Emeritus of the TRB Transportation Demand Forecasting Committee, and past chair of the International Association for Travel Behaviour Research.

Professor Miller has a long history of service to the community through his involvement chairing or serving on a number of travel demand modelling peer review panels, and in planning numerous symposiums, colloquia and conferences. Presently he is working in partnership with Professor Marianne Hatzopoulou to co-chair the Emerging Mobility Scholars Conference, a joint venture of the Positive Zero Transport Futures initiative and the U of T Mobility Network, scheduled for June 2023

Professor **Khandker Nurul Habib** is the Percy Edward Hart Professor in Civil and Mineral Engineering. His areas of specialization include transportation modelling and simulation, sustainable transportation planning, transport policy, and transport economics. His current research focus is placed on examining the intersection between transportation systems and economic development in the context of 21st century innovation, seeking to predict and analyze the ensuing impacts on urban development and transformation. For example, how human travel behaviour and urban transportation behaviour will change as use of autonomous vehicles becomes ubiquitous.

1 Post-script, June 2023: Professor Hatzopoulou will assume the post of Chair of the Civil and Mineral Engineering department in July 2023.

Professor Nurul Habib leads the Travel Demand Modelling Group, is a researcher with the Centre for Automated and Transformative Transportation Systems (CATTS), a collaborating researcher with the U of T Climate Positive Initiative, an affiliate of the U of T Mobility Network and U of T School of Cities, and FASE's Centre for Analytics and AI Engineering. He is a consecutive technical advisor to the Ontario government's annual "Transportation Tomorrow" survey, and is the current chair (2021-2024) of the Standing Committee on Traveler Behavior and Values (AEP30) of the Transportation Research Board (TRB), National Academies of Science, Engineering and Medicine (NASEM), USA. He also serves as an editorial advisor to the journals *Transportation, Transportmetrica A*, and as editor of the journal *Transportation Research Records.*

Professor **Matt Roorda** is the Tier 2 Canada Research Chair in Freight Transportation and Logistics. His research is based in urban freight data analysis and microsimulation modelling, with emphasis on freight optimization, freight and passenger transportation survey and analysis, and development of sustainable and efficient transportation systems. Most recently this has been with a view to generating new approaches for sustainable movement of goods and services in last mile delivery scenarios. His work in this direction has led to an innovative partnership between the U of T, Purolator and the City of Toronto to pilot the "Purolator Urban Quick Stop", an easily fabricated, convenient, centrally located and street-oriented module that serves as a parcel pick-up hub. Clients have the option of retrieving their parcels at the hub, or having them delivered via specially configured e-bikes. The initiative seeks to replace the need for individual "to the door" deliveries now made via driven vehicles, thereby helping to reduce retail delivery costs, while at the same time reducing traffic congestion and vehicle emissions. He is also exploring other solutions to help manage traffic congestion, such as establishing reserved stop areas for couriers, and shifting trailer truck daytime deliveries to nighttime.

Professor Roorda was the founding director of the Centre for Urban Freight Analysis, a precursor to today's Smart Freight Centre in which he serves as chair of its Scientific Advisory Committee. He is a principal investigator with the City Logistics for the Urban Economy (CLUE) initiative, a collaboration between researchers from three Canadian universities and representatives from the Greater Toronto and Hamilton area's regional goods movement ecosystem. CLUE collaborators are working to identify the factors that create demand for freight movement, analyze alternative logistics network designs to accommodate e-commerce demand, and explore new delivery methods and technologies that will help reduce emissions. Additionally, he is a researcher with the Centre for Automated and Transformative Transportation Systems (CATTS), and an affiliate of the U of T Mobility Network and U of T School of Cities. In addition, Professor Roorda currently serves as the Department's Associate Chair – Research.

Professor **Amer Shalaby** is a Bahen/Tanenbaum Chair in Civil Engineering. His research interests are centred in the areas of public transit planning and operations, simulation and modelling of transportation systems, and development of intelligent public transit systems.

His investigations and analyses have produced a number of innovative analytical tools that have helped municipalities worldwide improve the performance and competitiveness of their transit systems. In 2019 he received the ThinkTransit Award of Excellence in Innovation from international transit software developers Trapeze Group in recognition of his significant contribution to research in transit planning and management solutions.

Professor Shalaby is the founding director of the Transit Analytics Lab and the current co-director of the Centre for Automated and Transformative Transportation Systems (CATTS). He is an affiliate of the U of T Data Sciences Institute, the U of T School of Cities, and the Mobility Network. He is an International Associate of the Public Transport Research Group (Australia) and currently serves as associate editor of the Canadian Journal of Civil Engineering.

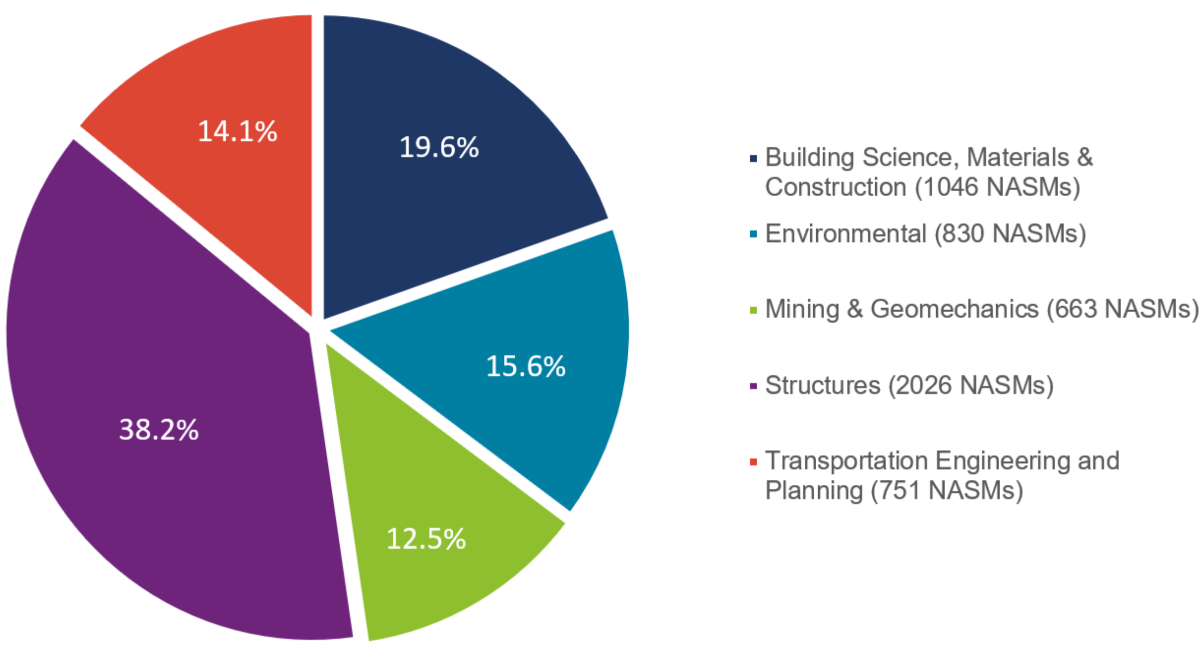
4.5 Research Facilities

The research facilities that the Department directly supports are addressed within the "Infrastructure" section of this report. In summary, our key research facilities include the following:

- Structural Testing Facility
- Concrete Materials Laboratory
- Rock Fracture Dynamics Facility
- Drinking Water Research Laboratory (Environmental Lab)
- Groundwater Research Laboratory (Environmental Lab)
- Goldcorp Mining Innovation Suite
- Intelligent Transportation Systems Lab

The Department currently allocates a total of 5,316 NASMs of its assigned space to research. The following chart shows the distribution of space dedicated to research activities by research theme.

Figure 4.1 Department of Civil and Mineral Engineering – Distribution of Departmental Research Space by Research Theme, as at December, 2022



4.6 Centers and Institutes

Through natural evolution of the research process a number of department-generated centres have now led to the development of newly defined, multi- and interdisciplinary research collectives. For instance, many of the research directions and added value learning initiatives spearheaded through UTTRI (founded in 2000) now forms the basis for the breadth of collaborative investigations and knowledge translation initiatives generated through the University's multidisciplinary Mobility Network (founded in 2020.)

4.6.1 U of T Mobility Network

The U of T Mobility Network is a partnership of researchers and scientists from academia, industry, government, and the community, who work together to examine the gamut of issues related to human mobility and the transportation sector. Their wide-ranging research and learning activities are arranged under seven distinct "Knowledge Clusters": Urban Equality and Inclusion, Climate Change and Health, Mobility Technologies and Services, Freight and Urban Goods Movement, Land Use Planning and Economy, Behavioural Analysis Modelling, and Governance, Policy Analysis and Managing Change. As evidenced when reviewing the research profiles of our faculty members, the U of T Mobility Network provides a dynamic avenue and enables a wide range of opportunities for broadly-based collaboration for a great many of the Department's principle researchers.

In addition to facilitating dynamic, multidisciplinary research, the U of T Mobility Network also sponsors a robust program of extra curricular learning activities and community events such as research conferences and symposia to foster discovery, information exchange, and knowledge translation. Their research range and activities can be viewed on their website at www.mobilitynetwork.utoronto.ca.

4.6.2 Centre for the Sustainable Built Environment

A progressive offshoot of the Centre for the Resilience of Critical Infrastructure is the recently instituted Centre for the Sustainable Built Environment (founded in 2022). This initiative is composed of a multidisciplinary team of researchers from across the U of T, working in partnership with a consortium of representatives from all segments of the construction sector. This includes urban planners, developers, architects, contractors, and building materials manufacturers.

Their collective goal is to identify strategies that will lower the environmental footprint of new infrastructure developments by reimagining how communities and city systems are designed, where they are built, and the materials they are made of. A further aim is to speed up the process for knowledge translation so that the insights gained through their research can be readily applied to practice.

Five faculty members from the Department of Civil & Mineral Engineering are integrally involved in this enterprise: Professors Evan Bentz, Heather MacLean, Daman Panesar, Daniel Posen and Shoshanna Saxe.

The Centre's website is currently under construction. The following link will provide more details regarding this initiative: Centre for the Sustainable Built Environment Archives - U of T Engineering News (utoronto.ca)

4.6.3 U of T Data Sciences Institute (DSI)

Another broadly-based research cluster a number of our faculty are affiliated with is the University's Data Sciences Institute (DSI). Formed in 2021, the DSI stemmed out from U of T's institutional strategic research plan and its resulting "Initiatives Portfolio". The purpose of the Initiatives Portfolio is to connect and build upon the University's efforts to foster the creation of sustainable, large-scale, cross-divisional and interdisciplinary initiatives.

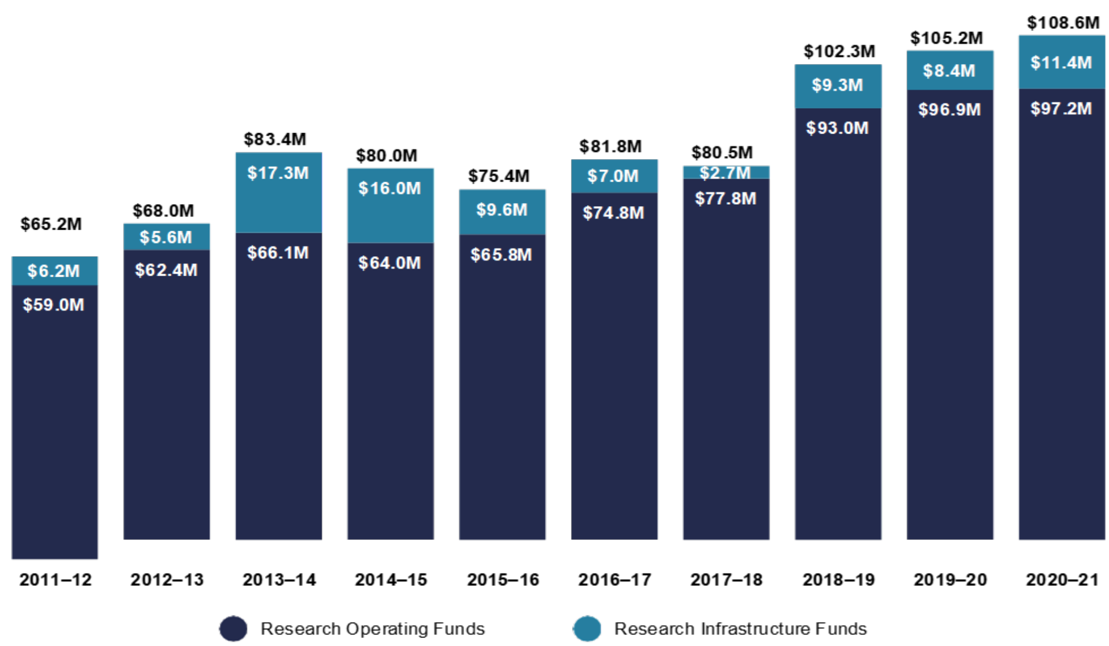
The DSI is also a multi-disciplinary consortium, involving researchers from all campuses, faculties and departments of U of T and its partner healthcare institutions: University Health Network, Mt. Sinai Health/Lunenfeld-Tanenbaum Research Institute, St. Michael's Hospital, Baycrest, and the Hospital for Sick Children. The goal of the Data Sciences Institute (DSI) is to accelerate the impact of data sciences across disciplines, and facilitate community connection by bringing researchers and trainees together to support data sciences research, innovation, collaboration, and training. Detailed information can be viewed on their website at Data Sciences Institute (DSI) Home - DSI (utoronto.ca)

Ten researchers from the Department of Civil and Mineral Engineering are participating in this initiative: Baher Abdulhai, Tamer El-Diraby, Sebastian Goodfellow, Marianne Hatzopoulou (who also serves as Head of the network's Research and Academics Committee: Air Quality Group), Seungjae Lee, David Meyer, Shoshanna Saxe, Amer Shalaby, Jeffrey Siegel, and Marianne Touchie.

4.7 Research Funding

Research infrastructure and research operating funding within the Faculty has increased by 44% over the past five years (Fig.4.2) totalling $108.6-million in 2020-21, with the largest proportion of this ($61.5-million, as shown in Table 4.1) provided through Canadian federal government sources. Corporate and other sources, such as industry consulting contracts, accounted for a combined total of $38.7-million, with the Ontario provincial government providing the remaining $8.2-million. Government research funds are generally accorded through various awards competitions, such as NSERC and NCE, and in the case of research infrastructure funding via CFI.

Figure 4.2 Total FASE Research Funding (Infrastructure and Operating), 2011-12 to 2020-21



Note 1: Data is based on grant years (April to March). The figures in this chapter report research funding the Faculty received in 2020–2021. Because it takes some time after the completion of a fiscal year for research funding data to become final, this is the most recent year for which data are available.

Note 2: Research operating funding excludes grants received under the following research infrastructure programs: Canada Foundation for Innovation (except the CFI Career Award); NSERC Research Tools & Instruments program for faculty; Ontario Innovation Trust; and Ontario Research Fund – Research Infrastructure.

Table 4.1 Total FASE Research Funding (Infrastructure and Operating) by Year and Source, 2011-12 to 2020-21

	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total
2011–12	$38,022,095	$6,969,732	$6,702,708	$13,507,723	$65,202,257
2012–13	$37,100,533	$9,035,997	$6,277,980	$15,621,407	$68,035,916
2013–14	$43,788,987	$17,138,393	$7,749,947	$14,683,976	$83,361,303
2014–15	$46,127,701	$11,858,254	$7,917,673	$14,075,827	$79,979,456
2015–16	$44,038,639	$11,307,741	$7,952,218	$12,090,798	$75,389,396
2016–17	$46,838,977	$12,204,142	$8,547,459	$14,244,259	$81,834,837
2017–18	$46,523,676	$11,391,063	$13,007,020	$9,552,343	$80,474,103
2018–19	$55,870,887	$12,985,421	$17,153,282	$16,293,418	$102,303,008
2019–20	$55,416,469	$10,266,990	$20,522,389	$19,033,630	$105,239,478
2020–21	$61,541,572	$8,251,500	$19,910,850	$18,848,924	$108,552,846

The above demonstrates that, collectively, researchers with the Faculty have achieved a 148.8% increase in the amount of research funding attracted through industry partnerships over the past five years, totalling $19.9-million in 2020-2021. Although not tracked independently by the Department, a comprehensive listing of active industry partnerships on record in 2021-22 can be found in the Faculty's "By the Numbers 2022" report, a copy of which is provided as supplemental documentation to this Self-study report[2].

In examining this from the departmental perspective, the Civil and Mineral Engineering department's contribution to industry sponsored research rested at $2-million, or roughly 10% of the Faculty total (Table 4.2)

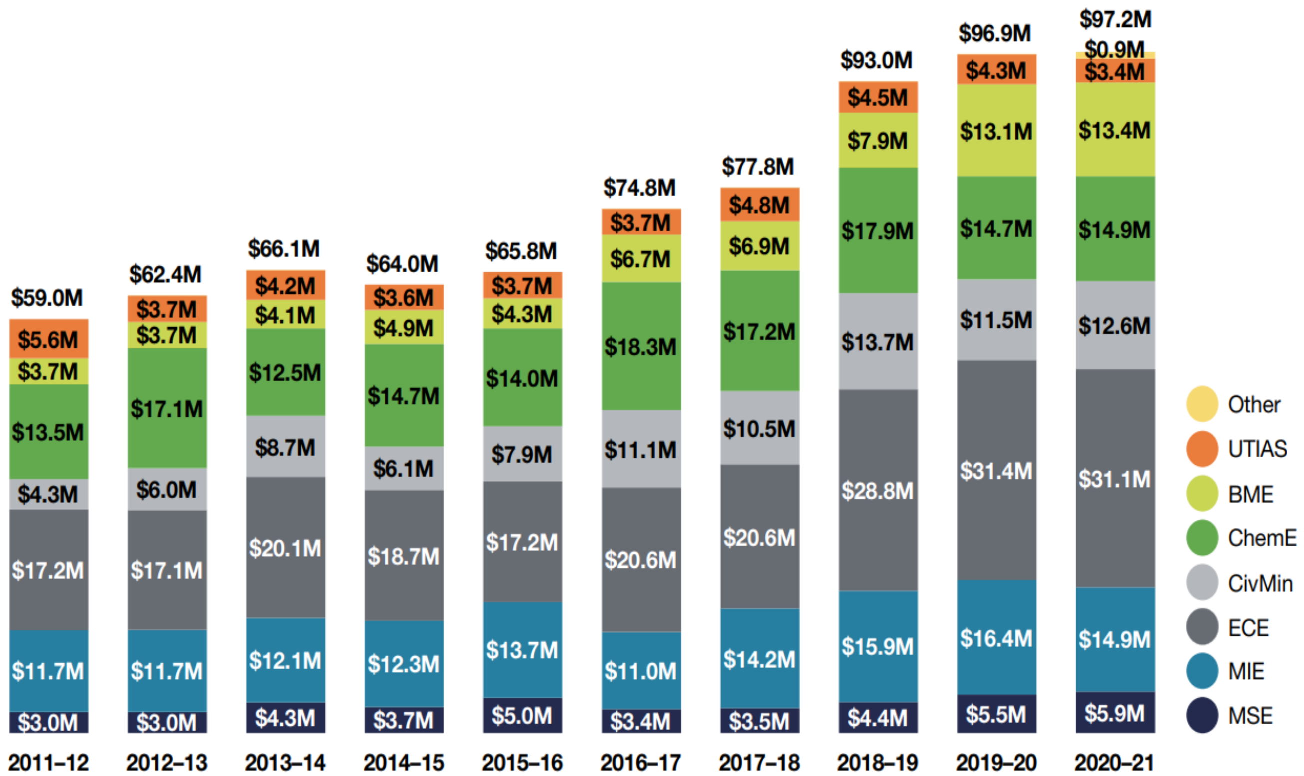
Table 4.2 Distribution of Industry Sponsored Research by Academic Area, 2011-12 to 2020-2021

	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21
UTIAS	$420,400	$390,865	$342,396	$584,609	$674,557	$313,998	$474,246	$483,164	$635,400	$532,994
BME		$167,789	$1,301	$346,061	$4,802	$427,108	$285,487	$373,191	$371,310	$392,442
ChemE	$1,897,761	$1,990,738	$1,770,631	$920,026	$927,888	$570,070	$2,878,724	$1,951,303	$2,569,555	$1,872,477
CivMin	$515,246	$585,360	$470,776	$479,896	$1,013,993	$715,923	$991,529	$1,645,296	$2,659,278	$2,014,331
ECE	$2,891,234	$2,275,037	$3,482,268	$3,446,268	$3,276,132	$4,392,019	$5,166,696	$8,590,717	$10,116,805	$10,803,603
MIE	$679,470	$757,191	$1,396,359	$2,007,844	$1,824,131	$1,738,104	$2,835,767	$3,425,210	$3,530,452	$3,314,904
MSE	$298,597	$111,000	$286,216	$132,970	$230,715	$390,239	$374,571	$684,401	$639,589	$980,100
Total	**$6,702,708**	**$6,277,980**	**$7,749,947**	**$7,917,673**	**$7,952,218**	**$8,547,459**	**$13,007,020**	**$17,153,282**	**$20,522,389**	**$19,910,850**

Of the total $97.2M in research operating funding achieved within FASE, the Department accounts for $12.6M, or 12.9% (Fig.4.2), which is comparable to other cognate FASE units of similar size, and on par with the Department's ratio of appointed faculty.

2 See "By the Numbers" Figure 4.6b.

Figure 4.3 Distribution of Research Operating Funding by Academic Area, 2011-12 to 2020-21



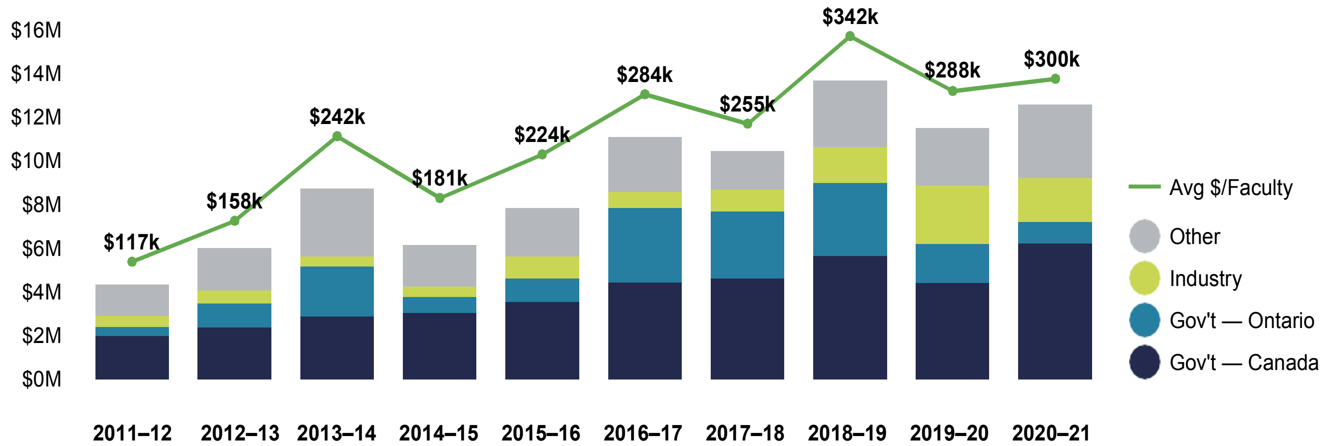
The median average of research operating funding attracted per faculty member across FASE rested at $393K in 2020-21 (Table 4.3).

Table 4.3 Research Operating Funding by Year, Source and Funding per Faculty Member, Faculty of Applied Science & Engineering, 2011-12 to 2020-21

	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Funding per Faculty Member
2011–12	$34,284,430	$4,535,363	$6,702,708	$13,507,723	**$59,030,224**	$274,559
2012–13	$32,008,870	$8,511,021	$6,277,980	$15,621,407	**$62,419,278**	$286,327
2013–14	$33,553,784	$10,084,984	$7,749,947	$14,683,976	**$66,072,691**	$293,656
2014–15	$35,298,439	$6,661,150	$7,917,673	$14,075,827	**$63,953,090**	$288,077
2015–16	$37,246,309	$8,462,936	$7,952,218	$12,090,798	**$65,752,260**	$293,537
2016–17	$40,620,860	$11,388,721	$8,547,459	$14,244,259	**$74,801,300**	$328,076
2017–18	$43,815,559	$11,391,063	$13,007,020	$9,552,343	**$77,765,985**	$332,333
2018–19	$49,680,508	$9,831,591	$17,153,282	$16,293,418	**$92,958,799**	$397,260
2019–20	$48,300,680	$8,998,584	$20,522,389	$19,033,630	**$96,855,282**	$403,564
2020–21	$51,515,634	$6,894,569	$19,910,850	$18,848,924	**$97,169,976**	$393,401

Comparing this within CivMin, Figure 4.4 below shows that the average operating research funding per faculty member in 2020-21 was approximately $300K, with the greater share also coming from Canada government incentives and awards ($6.2M, of a total of $12.6M.)

Figure 4.4 Research Operating Funding by Year, Source and Funding per Faculty Member — Department of Civil and Mineral Engineering, 2011-12 to 2020-21



This is a slight decrease from the consolidated departmental research funding tabulated in 2018-19, which amounted to an average of $342K per faculty member. This could be reflective of temporary setbacks and resets related to COVID-19, such as workplace shutdowns and redistribution of government priorities during the years 2020 and 2021.[3]

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3 Comprehensive figures for 2021-2022 and 2022-2023 were not available at the time of preparing this report.

4.8 Research Impact and Assessment

All researchers in the department, both faculty and student, are proactive in competing for scholarships and grants to support their work. In a recent survey of our doctoral stream graduate students 72% of respondents indicated that they regularly compete for the research grants and graduate awards available to them (see Self-Study 2022 Doctoral-Stream Programs survey results, Appendix A.7.)

At the faculty level, a full 100% of our researchers responded to calls for proposals through Tri-Agency funding initiatives and other open competitions in 2019-20 and, as shown in Table 4.4 below, our sustained participation rate has been above 90% over the past eight years. This is consistent with participation levels achieved in comparable units within the University's Physical Sciences division (Division III).

Table 4.4 Comparison of Participation Rates for Tri-Agency Funding: Department of Civil & Mineral Engineering, Faculty of Applied Science & Engineering, Division III and all U of T, 2011 to 2019

ELIGIBLE	2011	2012	2013	2014	2015	2016	2017	2018	2019
Dept. Civil & Mineral Engineering	36	33	35	36	37	40	42	40	41
All Division III: Physical Sciences	459	460	462	461	465	478	521	518	561
All UT Departments	1,977	1,933	1,973	2,003	2,029	2,054	2,175	2,127	2,315
PARTICIPATING	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**
Dept. Civil & Mineral Engineering	30	31	34	34	35	39	40	40	39
All Division III: Physical Sciences	415	430	430	431	431	446	494	492	528
All UT Departments	1,290	1,306	1,270	1,327	1,398	1,437	1,543	1,448	1,592
PERCENT PARTICIPATING	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**
Dept. Civil & Mineral Engineering	83.3%	93.9%	97.1%	94.4%	94.6%	97.5%	95.2%	100.0%	95.1%
All Division III: Physical Sciences	90.4%	93.5%	93.1%	93.5%	92.7%	93.3%	94.8%	95.0%	94.1%
All UT Departments	65.3%	67.6%	64.4%	66.3%	68.9%	70.0%	70.9%	68.1%	68.8%

Data source: Research & Innovation Dashboards: Tri-Agency Market Share Dashboards: Participation in CRC-Eligible Tri-Agency Programs Updated September 7, 2022

Note 1: Participation in Tri-Council CRC-eligible programs 2012-13 to 2020-21 as reported by Office of Research Services.

Note 2: 'Percent Participating' refers to the participating faculty of the current year and the eligible faculty of the previous Fall session to reflect the cycle of application and funding. e.g. Participation rate for 2019-20 = Count of 2019-20 participating faculty count of 2018 eligible faculty and so on for prior years.

Note 3: Eligible faculty are defined as tenure/tenure stream professorial ranks paid by the University of Toronto. Clinicians and status-only members are excluded. Faculty appointed in central administrative units (e.g. Office of the Dean, Provost's office etc.) are excluded.

Note 4: Faculty members included in the 'Participating' columns were selected from Research Services' internal records if they fulfilled one of the following criteria: **a.** Holds a grant from a Tri-Council CRC-eligible program (excluding NCEs), with an instalment between April and March of each year; **b.** Applied for a grant from a Tri-Council CRC-eligible program between June of the preceding year and December of the stated period.For example, 2019-20 participating faculty either held a grant in April 2019 to March 2020 or applied for a grant between June 2019 and December 2020.

Note 5: Participation rates relate to the faculty member's unit of primary appointment, regardless of which unit approved an application or is administering a grant.

Note 6: Division III: Physical Sciences is based on SGS Division categories.

The net result of our efforts in competing for research awards over this same timeframe is shown in the table below (Table 4.5), expressed as a total of awards received. Please note that this tabulates awards attracted through external sources only and is exclusive of institutional initiatives, which had been factored into this data set in prior years.
As can be seen, although our faculty complement has remained unchanged, our collective success in securing support for our research has resulted in a 62% increase in active awards over our 2014 count.

Table 4.5 Active Award Count Pro-rated to Grant Year (April-March) – Department of Civil and Mineral Engineering, 2014 to 2021

Funding Source	2014	2015	2016	2017	2018	2019	2020	2021
Tri-Agency	60	59	78	88	84	85	75	124
Government, Other	33	41	32	50	51	49	35	36
Not-for-profit	30	24	26	26	17	26	25	23
Private Sector	11	10	19	19	23	29	30	32
Total	**134**	**134**	**155**	**183**	**175**	**189**	**165**	**215**

With respect to our collective contribution to the awards count of the Faculty as a whole, the Civil and Mineral Engineering department held approximately 15% of the Faculty total in 2021, which is proportional relative to our faculty complement.

Table 4.6 Active Award Count Pro-rated to Grant Year (April-March) – Faculty of Applied Science and Engineering, 2014 to 2021

Funding Source	2014	2015	2016	2017	2018	2019	2020	2021
Tri-Agency	526	526	572	571	589	600	549	845
Government, Other	181	177	182	195	178	178	159	177
Not-for-profit	185	168	170	135	144	184	236	204
Private Sector	109	124	130	131	155	190	202	194
Total	**1,001**	**995**	**1,054**	**1,032**	**1,066**	**1,152**	**1,146**	**1,420**

The Department's success in securing Tri-Agency grants, namely NSERC Discovery grants, is shown in the table below (Table 4.7.) The chart reflects our sustained rate of success over the past eight award cycles, and shows this in comparison to Faculty achievement. Please note that the count shown in column "Fall 2020" is based on preliminary information, still to be updated via Central Services. However, when considering the Department's success rate relative to the Faculty in the preceding year (Fall 2019), we see that our success represents approximately 14% of the Faculty total, which can be appreciated as equitable when measured within a Faculty constituted of seven distinct research based departments.

Table 4.7 Success in Tri-Agency Grant Applications, Department of Civil and Mineral Engineering, Fall 2013-Fall 2020

NSERC Discovery Grant		Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	Fall 2019	Fall 2020
Dept. of Civil & Mineral Engineering	Successful	10	5	9	8	8	8	6	1
	Unsuccessful	0	1	1	3	1	2	0	1
	Total Applications	**10**	**6**	**10**	**11**	**9**	**10**	**6**	**2**
Faculty of Applied Science & Engineering	Successful	61	45	37	55	45	56	45	15
	Unsuccessful	9	8	9	7	5	7	7	9
	Total Applications	**70**	**53**	**46**	**62**	**50**	**63**	**52**	**24**

4.9 Technology Transfer Indicators

Research activity within the department resulted in a total of 40 new invention disclosures over the nine-year period 2014-2022, achieving approximately five disclosures per year on average. The chart below provides a comparison of the Department's performance against the University as a whole, and represents our relative percentage share of the University total.

Table 4.8 Technology Transfer Indicators, Department of Civil and Mineral Engineering FY2014 to FY2022

		FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022	9-YR SUM
New Invention Disclosures	CML	5	5	6	2	3	3	7	4	5	40
	U of T	145	175	163	204	161	192	182	122	160	1,504
	Share of U of T	3.4%	2.9%	3.7%	1.0%	1.9%	1.6%	3.8%	3.3%	3.1%	2.7%
Priority Patent Applications	CML	4	1	1	0	3	0	1	1	1	12
	U of T	92	63	81	85	85	81	73	80	71	711
	Share of U of T	4.3%	1.6%	1.2%	0.0%	3.5%	0.0%	1.4%	1.3%	1.4%	1.7%
Issued Patents	CML	7	1	12	4	3	6	13	0	1	47
	U of T	88	114	107	106	131	121	135	121	81	1,004
	Share of U of T	8.0%	0.9%	11.2%	3.8%	2.3%	5.0%	9.6%	0.0%	1.2%	4.7%
New License & Option Agreements	CML	1	1	0	0	1	1	0	1	2	7
	U of T	39	39	33	38	43	44	34	39	28	337
	Share of U of T	2.6%	2.6%	0.0%	0.0%	2.3%	2.3%	0.0%	2.6%	7.1%	2.1%
New Start-ups Formed (research-based)	CML	1	0	1	0	2	0	0	0	0	4
	U of T	19	20	25	11	20	16	19	12	3	145
	Share of U of T	5.3%	0.0%	4.0%	0.0%	10.0%	0.0%	0.0%	0.0%	0.0%	2.8%
New Commercialization Projects Initiated	CML	3	0	2	1	2	1	1	3	2	15
	U of T	40	52	68	103	84	66	76	64	95	648
	Share of U of T	7.5%	0.0%	2.9%	1.0%	2.4%	1.5%	1.3%	4.7%	2.1%	2.3%

Data Source: Research & Innovation Dashboards, Office of Vice-President, Research.

Data as at May 2, 2022.

Note 1: The 'Fiscal Year' runs from May to April (e.g., FY2021 runs from May 1, 2020 to April 30, 2021).

Note 2: Data for FY2021 is preliminary and may change until finalized in winter 2022.

Note 3: The series of Innovation dashboards allows users to gauge the volume, status, and success of innovation activities such as invention disclosures, patent applications, licensing agreements, commercialization projects and start-up companies tracked by the Innovations & Partnerships Offices within the Division of the Vice-President, Research & Innovation (VPRI). These dashboards are based on information in the Inteum (Minuet) system and are managed by the Research Information Analysis team at the VPRI. The data in these dashboards is refreshed monthly.

Note 4: 'Disclosures' capture all inventors (including co-inventors) for all disclosures filed in each respective fiscal year. All other technology transfer indicators are only credited to the principal investigator/inventor.

Note 5: Partner hospitals includes start-ups based on U of T intellectual property, or supported by a U of T incubator/accelerator, with founders from partner hospitals. This does not include start-ups created based on hospital intellectual property.

Note 6: Definitions:

a. Invention Disclosure – filed by U of T research employees as soon as research is clearly conceptualized. Filling a disclosure documents the circumstances under which the invention or work occurred and provides the information necessary to evaluate inventorship or authorship, patentability and obligations to research sponsors outside the university.
All U of T inventors are given a full count for each invention disclosure they listed on. Where a disclosure has multiple inventors from a single academic unit or division, the disclosure is counted only once. All internal inventors are evenly weighted at the U of T total to prevent double counting.

b. Priority Patent Application – Priority patent applications are the first filing of the patentable subject matter at a patent office. The first filing might be a provisional or non-provisional filing. Priority patent applications do not include continuations, divisionals, or reissues, and typically do not include Continuations in Part (CIPs).

c. Issued Patent - There are three key requirements for a patent to be issued in any country; novelty, inventiveness and utility. Once a patent application has gone through an extensive evaluation process to ensure the invention meets these criteria, it becomes an issued patent. An issued patent is a government-granted monopoly that gives the patent owner the exclusive right to prevent others from making, using or selling the particular invention covered by the patent. Patent monopolies are limited by both time and territory.

d. License Agreement – Legal agreement allowing a third party to use, manufacture and/or sell an invention, usually in exchange for a fee.

e. Commercialization Project – Commercialization projects are designed to advance discoveries/inventions towards marketable products or processes that will benefit the public thus creating social and economic value. commercializable technologies. A commercialization project is initiated when an invention disclosure is accepted into the Innovation and Partnerships Office's (IPO's) portfolio.

Although our throughput to disclosures, patents and such may seem modest when compared to the University in aggregate, the data does show that our level of participation in these areas has remained consistent throughout. We view this level of achievement as steady state. As can be perceived from review of the faculty research biographies offered earlier in this report section, to the largest extent our community of researchers is intent in placing their investigation priorities toward identifying and understanding the causal effects of human activities on natural and built environments, and in finding solutions to address these real-time challenges. In so doing, they strive to help move society towards a sustainable future, and bring improvement to our way of living and communal quality of life. Inventions and ventures that emerge from our research investigations are certainly always a welcome outcome, but cannot rightly be the primary motivation that shapes our work.

4.10 Recognition of Leadership in Research

One measure of the leadership and excellence of our faculty research is demonstrated through the number of sponsored research and endowed chairs held within the department. The following is a list of all current such appointments, showing a total of 16 out of our total complement of 42 faculty (43.9%) holding chairs and professorships. We are pleased to note that of this 14% of the appointments are held by women faculty members.

Table 4.9 Department of Civil and Mineral Engineering Faculty Research Designations as at December, 2022

Faculty	Thematic Research Group	Named Appointment
Kamran Esmaeili	Mining/Geotechnical Eng.	Robert Smith Chair in Geomechanical Mine Design and Analysis
Giovanni Grasselli	Mining/Geotechnical Eng.	NSERC - Energi Simulation Industrial Research Chair in Fundamental Rock Physics and Rock Mechanics
John Hadjgeorgiou	Mining/Geotechnical Eng.	Pierre Lassonde Chair in Mining Engineering
John Harrison	Mining/Geotechnical Eng.	W.M. Keck Chair in Engineering Mechanics
Marianne Hatzopoulou	Transportation Eng.& Planning	Canada Research Chair in Transport Decarbonization and Air Quality
Heather MacLean	Environmental Engineering	Canada Research Chair in Sustainable Systems and Technology Assessment
Oya Mercan	Structural Engineering	Edwin Hart Professor of Civil and Mineral Engineering
David Meyer	Environmental Engineering	Edwin Hart Professor in Global Engineering
Khandker Nural Habib	Transportation Eng.& Planning	Percy Edward Hart Professor in Civil and Mineral Engineering

Faculty	Thematic Research Group	Named Appointment
Elodie Passeport	Environmental Engineering	Canada Research Chair in Environmental Engineering and Stable Isotopes
Daniel Posen	Environmental Engineering	Canada Research Chair in System-Scale Environmental Impacts of Energy and Transport Technologies
Matt Roorda	Transportation Eng.& Planning	Canada Research Chair in Freight Transportation and Logistics
Shoshanna Saxe	Environmental Engineering	Canada Research Chair in Sustainable Infrastructure
Amer Shalaby	Transportation Eng.& Planning	Bahen/Tanenbaum Chair in Civil Engineering, U of T
Jeffrey Siegel	Building Engineering	Bahen/Tanenbaum Chair in Civil Engineering, U of T
Lesley Warren	Mining/Geotechnical Eng.	Claudette MacKay Lassonde Chair in Mineral Engineering

Correspondingly, the following table illustrates the external awards our Civil and Mineral Engineering faculty members have received in recognition of their leadership and/or contribution to the profession, over the period 2014-2022.

Table 4.10 List of Awards Won by Faculty Members, Department of Civil and Mineral Engineering, 2014 to 2022

Surname	Given Name	Award	Organization	Award Start Date
Abdulhai	Baher	Inventor of the Year Award	University of Toronto	2014-05-21
Abdulhai	Baher	Fellow	Engineering Institute of Canada	2016-01-01
Abdulhai	Baher	Sandford Fleming Award	Canadian Society for Civil Engineering	2018-03-01
Abdulhai	Baher	Fellow	Canadian Academy of Engineering	2020-06-15
Abdulhai	Baher	Engineering Excellence Medal	Ontario Society of Professional Engineers	2021-03-31
Andrews	Robert	Albert E. Berry Medal	Canadian Society for Civil Engineering	2016-06-01
Andrews	Robert	Fellow	Canadian Academy of Engineering	2017-06-26
Andrews	Robert	Fellow	Canadian Society for Civil Engineering	2018-01-01
Andrews	Robert	Fellow	Engineering Institute of Canada	2019-01-01
Gauvreau	Douglas Paul	Fellow	Canadian Society for Civil Engineering	2019-05-01
Harrison	John	Glossop Medal	Engineering Group of the Geological Society (Great Britain)	2022-09-23
Hatzopoulou	Marianne	Brockhouse Canada Prize	Natural Sciences and Engineering Research Council of Canada	2021-11-17

Surname	Given Name	Award	Organization	Award Start Date
*Hooton	R Douglas	Fellow	Réunion Internationale des Laboratoires et Experts des Matériaux	2014-09-01
*Hooton	R Douglas	Wason Medal for Meritorious Paper	American Concrete Institute	2015-01-01
*Hooton	R Douglas	Julian C. Smith Medal	Engineering Institute of Canada	2016-01-12
*Hooton	R Douglas	Honorary Member	American Concrete Institute	2018-09-01
*Hooton	R Douglas	Fellow	Canadian Society for Civil Engineering	2020-06-01
*Hooton	R Douglas	C01 Bryant Mather Award	ASTM International Committee C01 on Cement	2022-06-21
*Hooton	R Douglas	Honorary Member	Reunion Internationale des Laboratoires et Experts des Materiaux (RILEM)	2022-09-08
Karney	Bryan	Camille A. Dagenais Award	Canadian Society for Civil Engineering	2016-06-01
MacLean	Heather	Fellow	Engineering Institute of Canada	2016-01-12
MacLean	Heather	Albert E. Berry Medal	Canadian Society for Civil Engineering	2017-01-01
MacLean	Heather	Fellow	Canadian Academy of Engineering	2017-06-26
MacLean	Heather	Julian C. Smith Medal	Engineering Institute of Canada	2018-11-15
Miller	Eric	Lifetime Achievement Award	International Association for Travel Behaviour Research	2018-12-01
Nurul Habib	Khandker	Sandford Fleming Award	Canadian Society for Civil Engi-neering	2020-06-01
Ogunsanya	Ibrahim	MetSoc Emerging Professional	The Metallurgy and Materials Society	2022-05-12
Packer	Jeffrey	Fellow	Canadian Society for Civil Engineering	2016-04-01
Packer	Jeffrey	Fellow	American Association for the Advancement of Science	2016-11-20
Packer	Jeffrey	Fellow	Engineering Institute of Canada	2019-01-01
Packer	Jeffrey	A.B. Sanderson Award	Canadian Society for Civil Engineering	2019-05-01
Packer	Jeffrey	Alfred F. Wong Lifetime Achievement Award	Canadian Institute of Steel Construction	2022-09-01
Saxe	Shoshanna	Clean50 Emerging Leader	Corporate Knights	2018-12-01
Saxe	Shoshanna	Young Engineer Medal	Professional Engineers Ontario (PEO) / Ontario Society of Profes-sional Engineers	2019-02-27
Shalaby	Amer	Sandford Fleming Award	Canadian Society for Civil Engineering	2019-05-01
Shalaby	Amer	Fellow	Canadian Society for Civil Engineering	2022-06-02

Surname	Given Name	Award	Organization	Award Start Date
Sheikh	Shamim	Horst Leipholz Medal	Canadian Society for Civil Engineering	2018-03-01
Sleep	Brent	Fellow	Canadian Society for Civil Engineering	2017-01-01
Touchie	Marianne	New Investigator Award	American Society of Heating, Refrigerating and Air-Conditioning Engineer	2018-07-06
Touchie	Marianne	Rising Star Award	Ontario Building Envelope Council	2021-11-22

Data Source: Awards & Honours Database (Office of Vice-President, Research and Innovation).
Note 1: Database includes records from 2014 to 2021 (data extracted Jan. 2022).
Note 2: Please note that the Research Awards and Honours database tracks prizes, awards and honours for research achievement, creative professional activity, and teaching or education received by faculty members during their appointment at University of Toronto. It does not include the following types of awards: salary awards (e.g. CRC, ERA); grants; fellowships at specific institutions; honorary or administrative positions in academic associations, societies or other universities; unelected fellowships or memberships in academic associations or societies.
* indicates Emeritus professors, retired post 2021

4.11 Large-scale Research Projects

As established throughout this section of our Self-study report, CivMin faculty are diligent in their pursuit to raise and secure funding to enable and continue their research programs, they perform at a level that is fully on par with all other researchers across FASE, their work and research achievements are well recognized through awards and sponsorships, and their research directions are both innovative and socially impactful.

Earlier in the report we highlighted the innovative initiatives led by Professors Matt Roorda (Purolator Urban Quick Stop) and Eric Miller (the Mobility Network). In the case of Professor Roorda, his project “City Logistics Solutions for Distribution in the Last-mile Economy”, which helped to fund the aforementioned Quick Stop project, attracted an NSERC Alliance grant totalling $3.1-million, with sub-grants flowing to partner institutions York and McMaster universities. Other partners on this project include the City of Toronto, the Regional Municipality of York, the Atmospheric Fund, and industry partners ESRI Canada, Geotab and CHET (Commercial Heavy Equipment Training, Ltd. The Mobility Network initiative spearheaded by Professor Miller attracted base support through the University of Toronto’s “Institutional Strategic Initiatives” program in the amount of $1.65-million, and involves multiple additional contributors.

As concluding evidence, we wish to highlight two additional projects led by CivMin faculty members that demonstrate leadership, show strength in collaboration and partnership, and which have attracted substantive resources in order to further their direction.

4.11.1 Advanced and Emerging Issues in Drinking Water Treatment

In December 2022, Professors Bob Andrews and Ron Hofmann secured sponsorship to address advanced and emerging issues in drinking water treatment through the NSERC Alliance/Mitacs Accelerate initiative. This is a five-year project, with possibility for extension, and has attracted funding in the amount of $3.97-million. The project involves multiple contributing partners which includes two cities (Barrie and Toronto) four regional municipalities (Durham, Peel, York, and Niagara), two municipal utilities (Peterborough Utilities Services, and Lake Huron & Elgin Area Water Supply System), a US-based, community-owned, not-for-profit utility (Eugene Water & Electric Board of Oregon), two international consulting groups (Brown and Caldwell, and De Nora Tech) and two government agencies (the Ontario Clean Water Agency, and Mitacs).

4.11.2 Fundamentals and Implications of Hydraulic Fracturing Technology

In 2021, Professor Giovanni Grasselli attracted a CFI/ORF award in the amount of $800,000, with a total project envelope of $1.4-million, to support his initiative “Towards the Sustainable Development of Energy Resources: Fundamentals and Implications of Hydraulic Fracturing Technology”. The funding has enabled the purchase of a VltomelxM300 X-ray micro-CT Package that will greatly improve hydraulic fracturing simulations, thereby advancing our understanding of the fundamentals and implications of the practice of hydraulic fracturing. His laboratory observations will be scaled to field operations through industry collaboration.

4.12 Rankings

World university rankings are an important measure of assessment, although currently there is no consensus within the field of higher education ranking that provides guidance as to how ranking surveys could be conducted in order to generate a unified comparison of results. As such, each ranking survey is based on the individual parameters or methodologies set by the various ranking bodies, and therefore results could be viewed as somewhat subjective. However, the University of Toronto tends to rely on the five most closely watched international rankings for assessment purposes: *Times Higher Education* World University Rankings, QS World University Rankings, Shanghai Ranking Consultancy’s Academic Ranking of World Universities, *U.S. News & World Report*'s Best Global Universities and National Taiwan University World University Rankings.

The following presents rankings from each of these sources to present an overview of how Civil and Mineral Engineering at the University of Toronto measures within these surveys.

In the Shanghai Ranking Consultancy’s Academic Ranking of World Universities (ARWU) we see where both Civil Engineering and Mineral & Mining Engineering at the University of Toronto rank in terms of world standing, and as compared to other Canadian universities in the global top 100.

Table 4.11a Academic Ranking of World Universities (ARWU) Canadian Universities in the Top 100 - Mining & Mineral Engineering, 2022

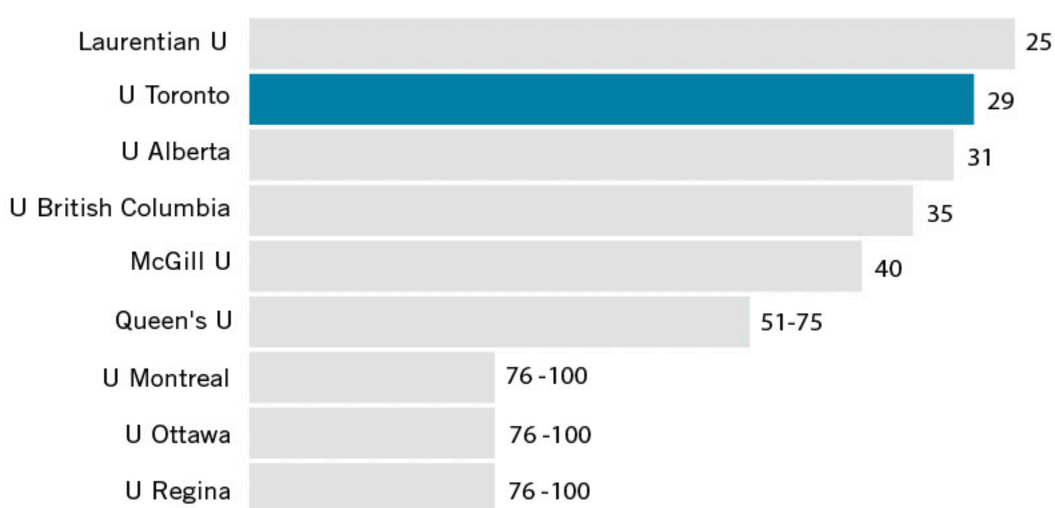
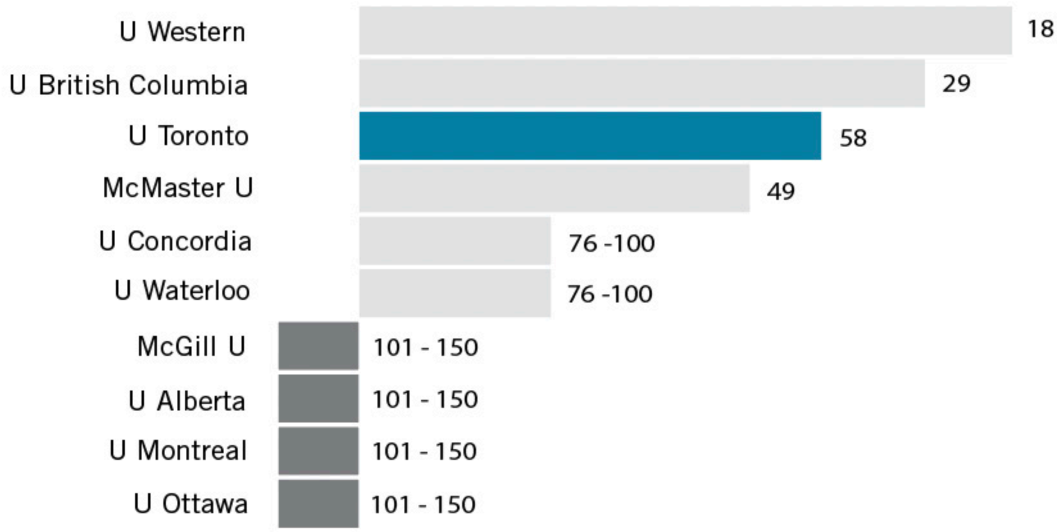


Table 4.11b Academic Ranking of World Universities (ARWU) Canadian Universities in Top-100 - Civil Engineering, 2022



In the QS World Rankings, we offer tables depicting the University of Toronto's standing in the top 200 in the field of Engineering and Technology, and in the subjects of Civil Engineering and Mineral and Mining Engineering, as well as their respective rank within the world top 50 as compared to other Canadian universities.

Table 4.12a QS World University Rankings: Top 200 Canadian Universities for Engineering and Technology 2023

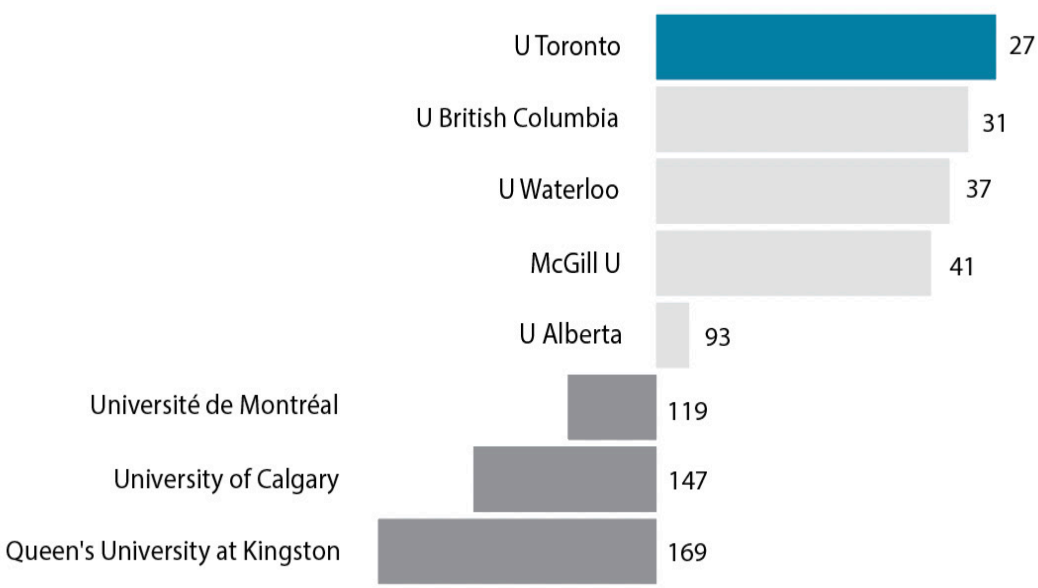


Table 4.12b QS World University Rankings: Canadian U15 Universities - Mineral Engineering 2023

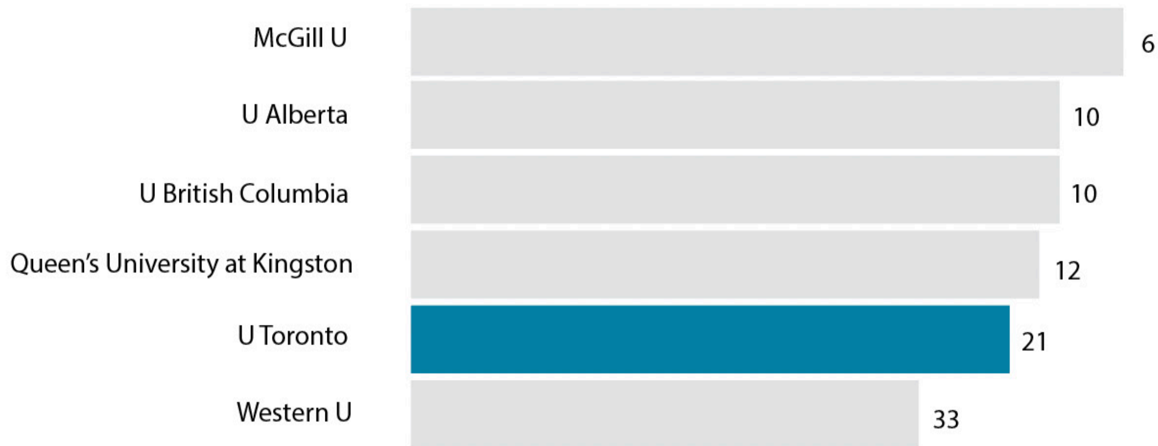


Table 4.12c QS World University Rankings: Canadian U15 Universities in Top 200 Universities - Civil and Structural Engineering 2023

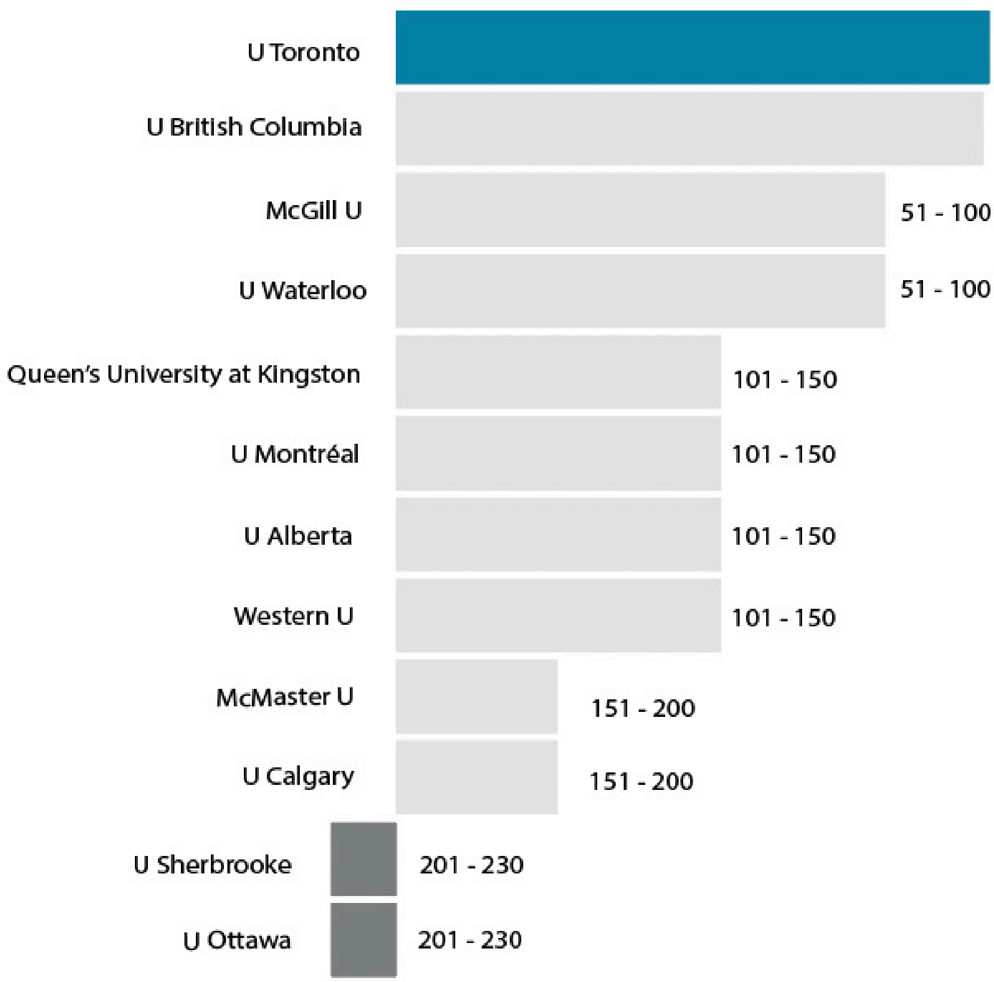


Table 4.12d QS Worls University Rankings: Top 50 Univerisities for Mineral and Mining Engineering 2023

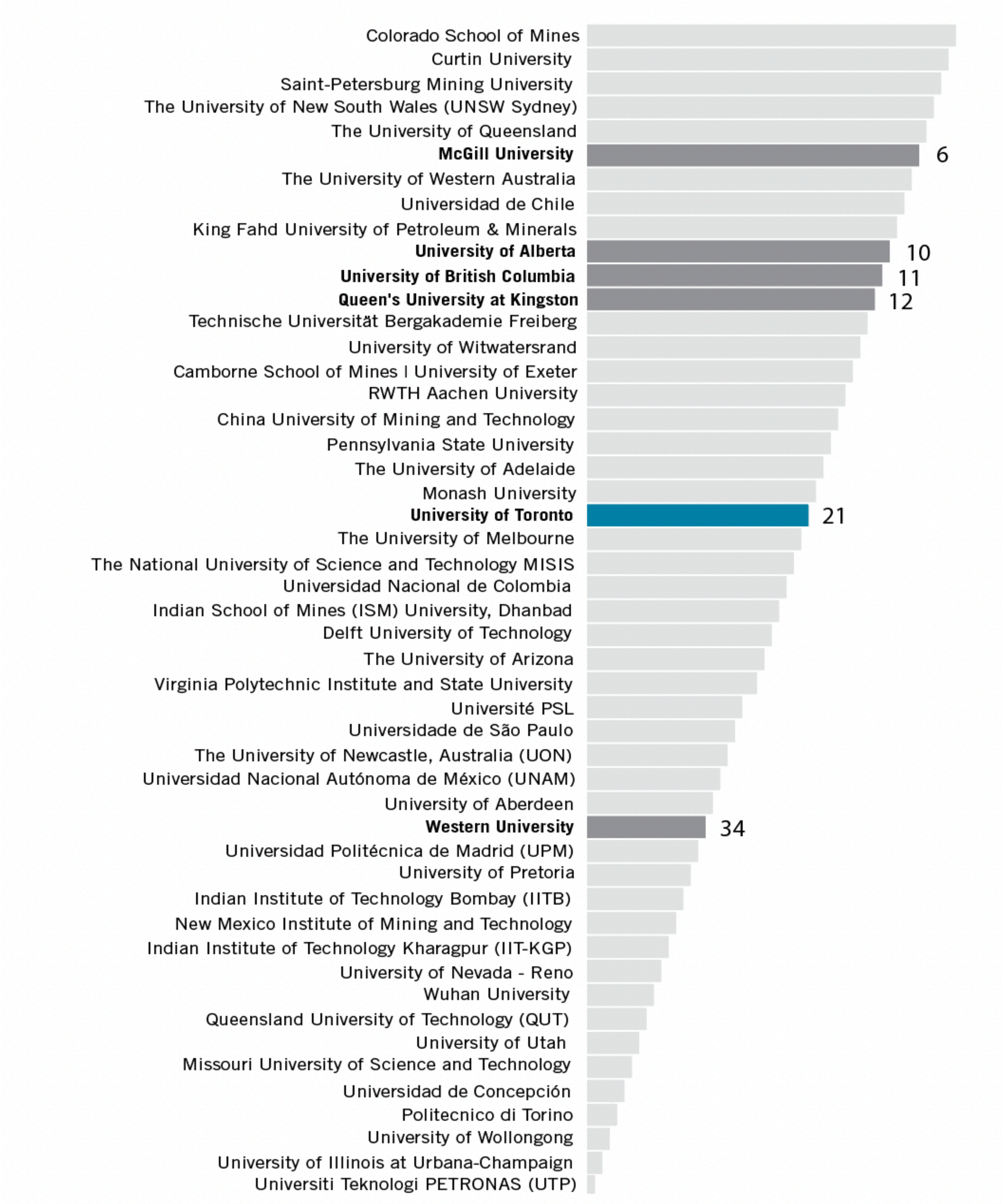


Table 4.12e QS World University Rankings: Top 50 Universities for Engineering and Technology 2023

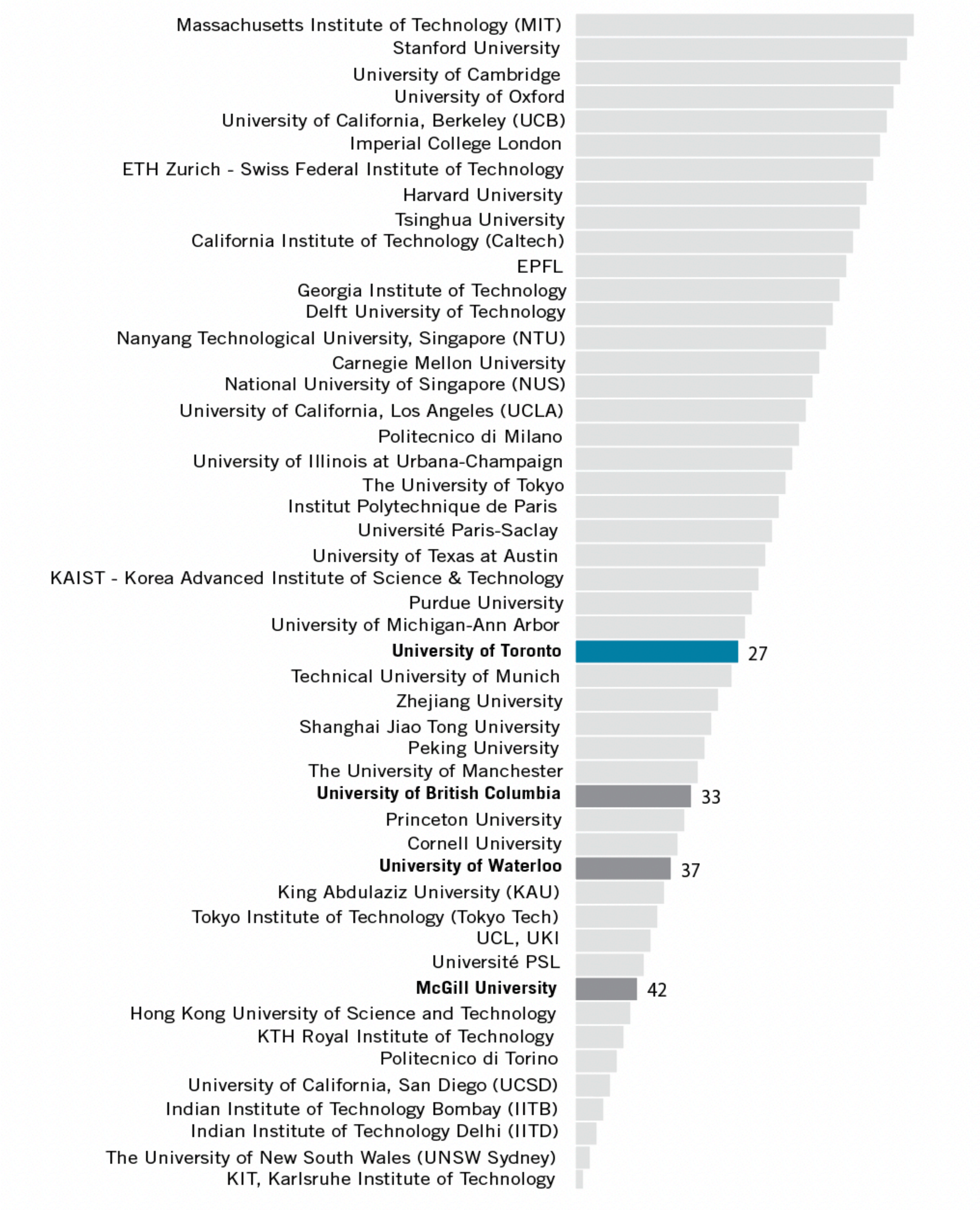
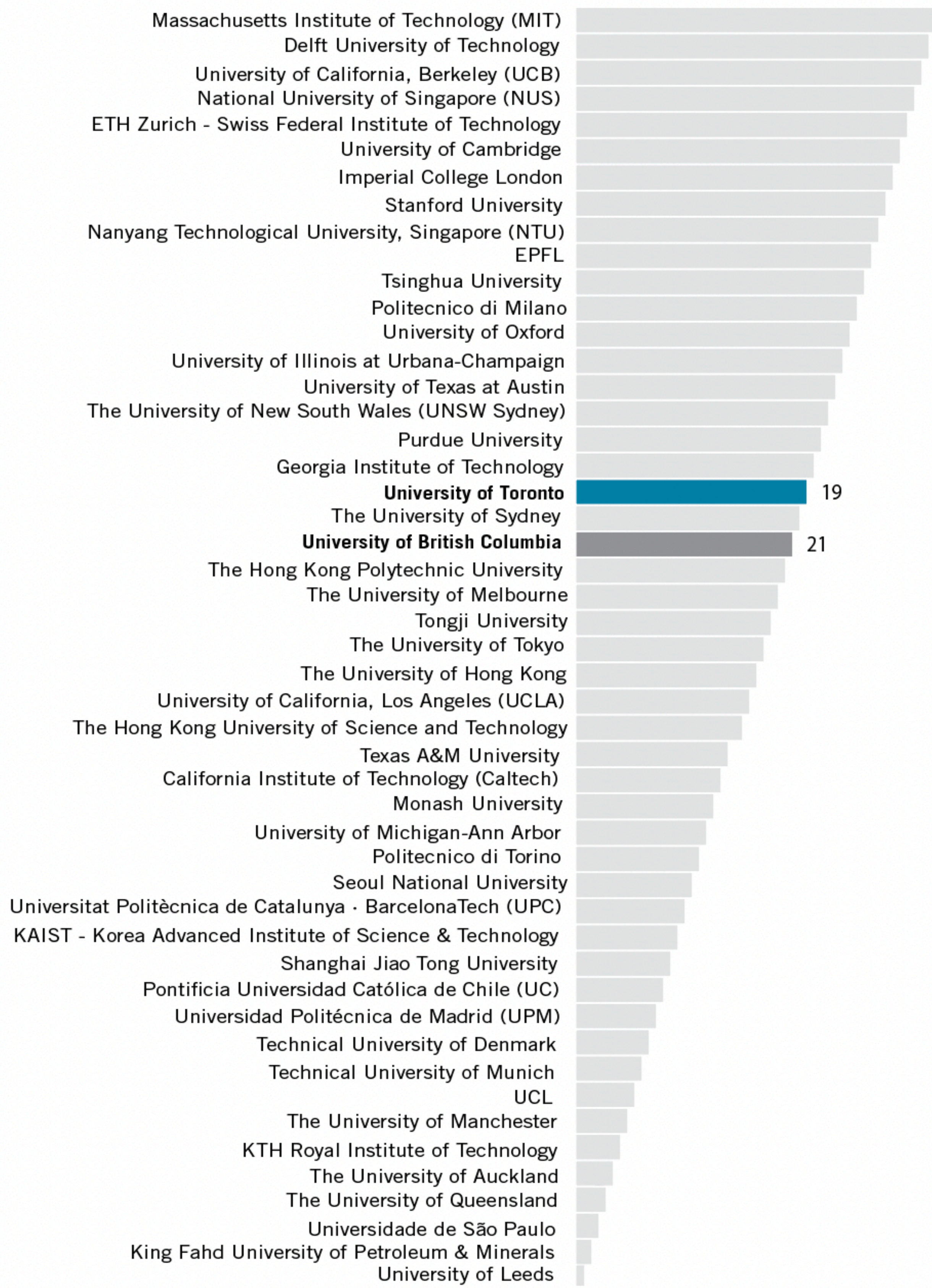


Table 4.12f QS World University Rankings: World Top 50 Universities for Civil Engineering 2023



The Times Higher Education World University rankings show the rank of Civil Engineering over the 5-year period 2018-2023, and provides a comparison of same among Canadian universities ranking in the world top 100. As can be seen, Civil Engineering at the University of Toronto has held the top rank consecutively throughout this period.

Other tables show the rank of both General Engineering and Civil Engineering at U of T within the world top 50 universities.

Table 4.13a THE World University Rankings: Canadian Universities in Top 100 Universities - Civil Engineering, 2018-2023

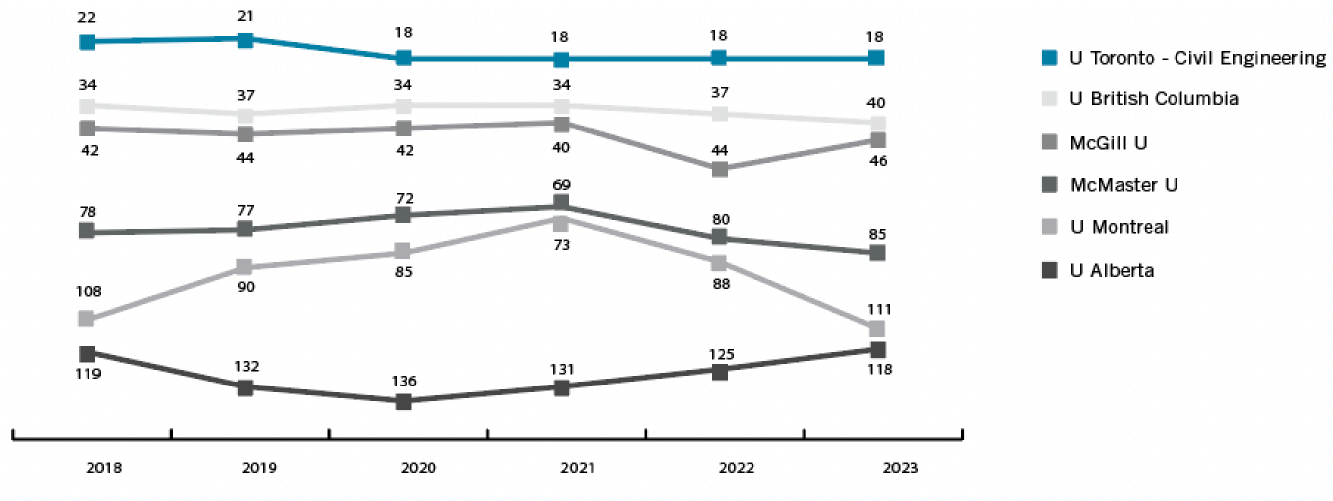


Table 4.13b THE World University Rankings: Top World Universities - General Engineering, 2023

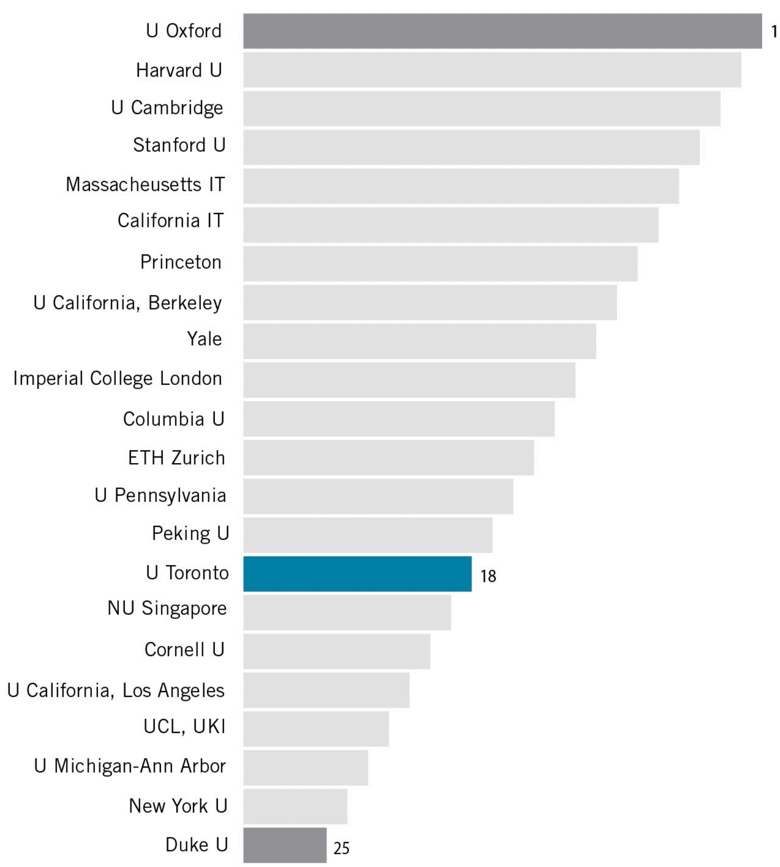
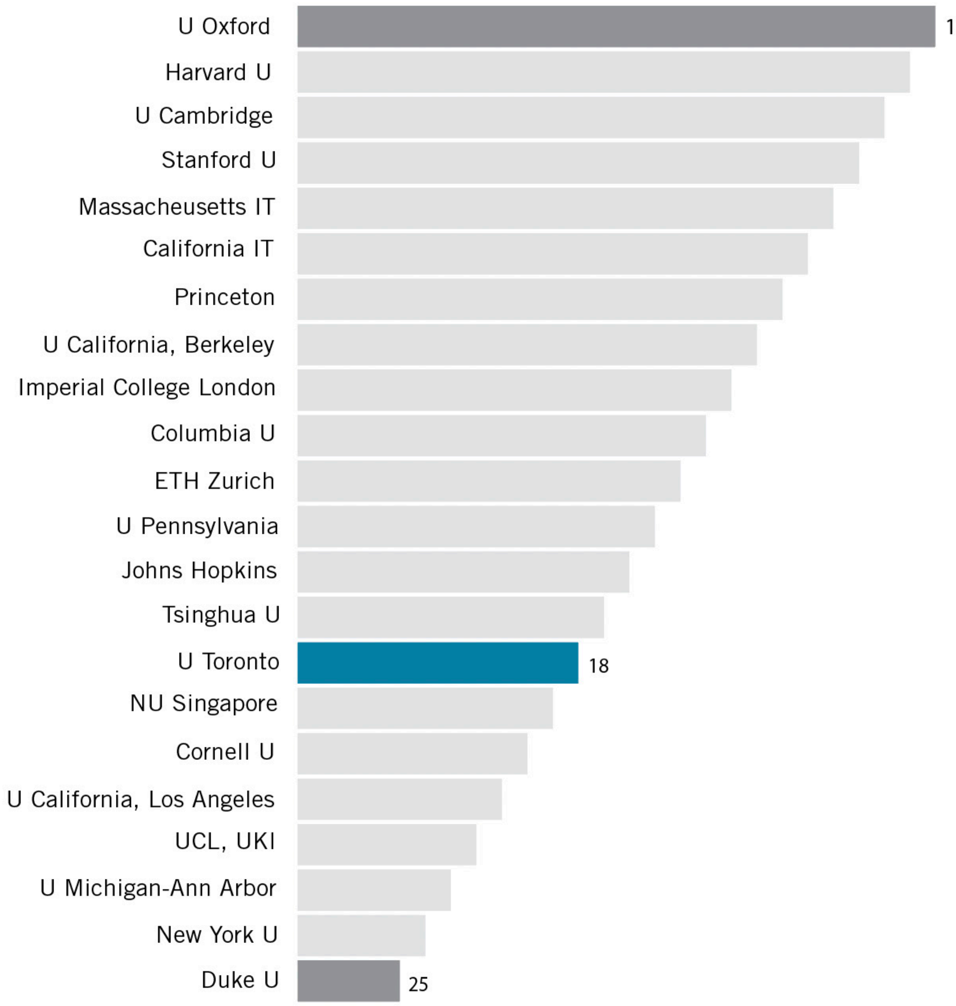


Table 4.13c THE World University Rankings: Top World Universities - Civil Engineering, 2023



The following NTU World ranking tables show the rank of the University of Toronto in the field of Engineering, and our positioning in the subject of Civil Engineering. As data specific to Mineral and Mining Engineering is not available, we offer reasonable comparisons in the subjects of Geosciences and Energy Sciences and Engineering.

Table 4.14a NTU World Rankings: Canadian Universities in Top 100 - Civil Engineering, 2022

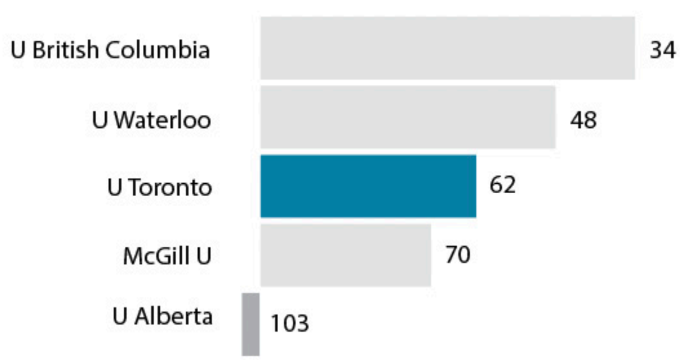


Table 4.14b NTU World Rankings: Canadian Universities in Top 100 - Geosciences, 2022

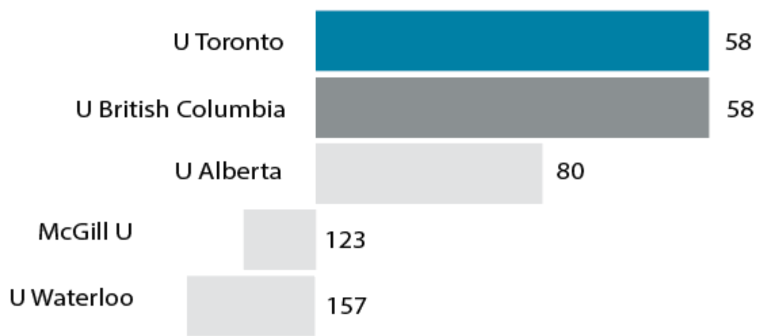


Table 4.14c NTU World Rankings: Canadian Universities in Top 100 - Energy Sciences and Engineering, 2022

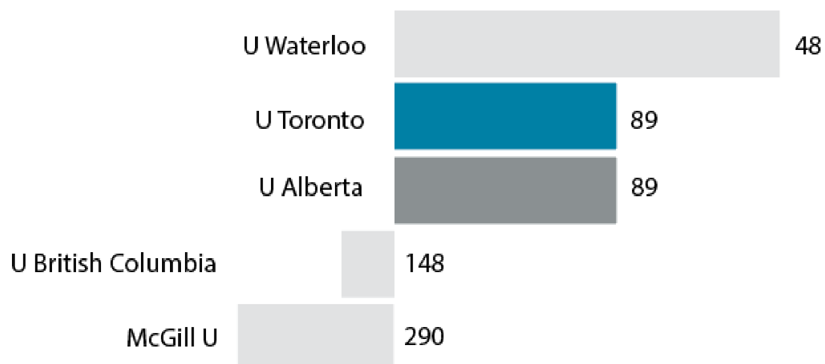
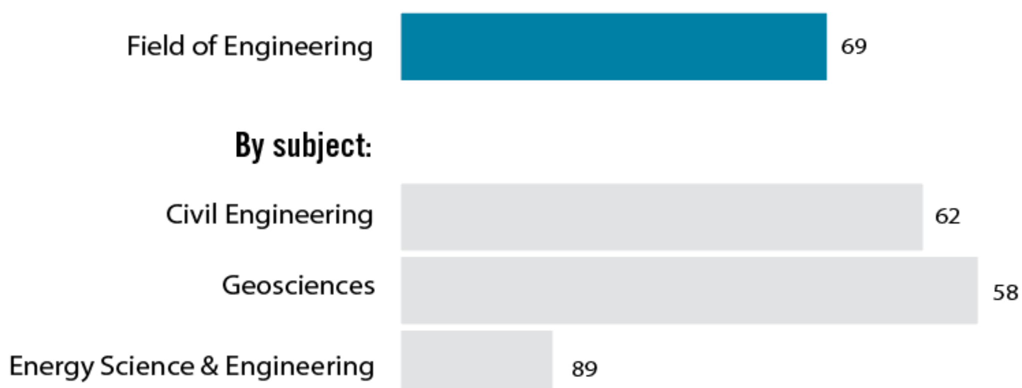


Table 4.14d NTU World Rankings: Field of Engineering, University of Toronto, 2022



Note: Subject rankings for Mineral/Mining Engineering is not available. Rankings for Geosciences and Energy Science and Engineering are provided as relative comparables

The US News & World Report's Best Global rankings show the position of Civil Engineering at the University of Toronto and, again, as specific data for mineral and mining engineering is not available, we offer ranking in Geosciences as a comparable ranking. The charts capture those Canadian universities ranked within the world top 100.

Table 4.15a US News Best Global Universities: Canadian Universites in Top 100 - Civil Engineering, 2022

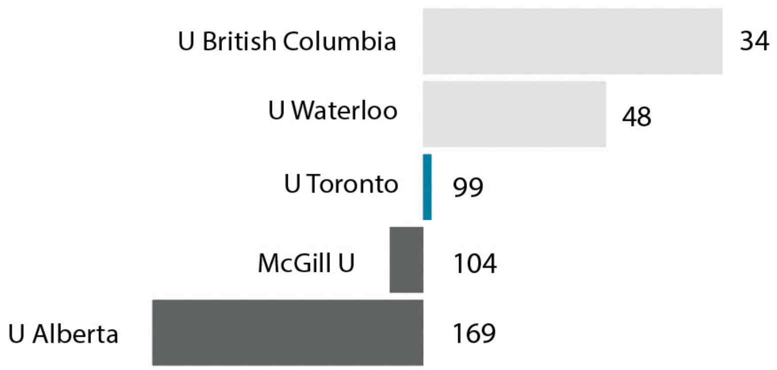


Table 4.15b US News Best Global Universities: Canadian Univerisites in Top 100 - Geosciences, 2022

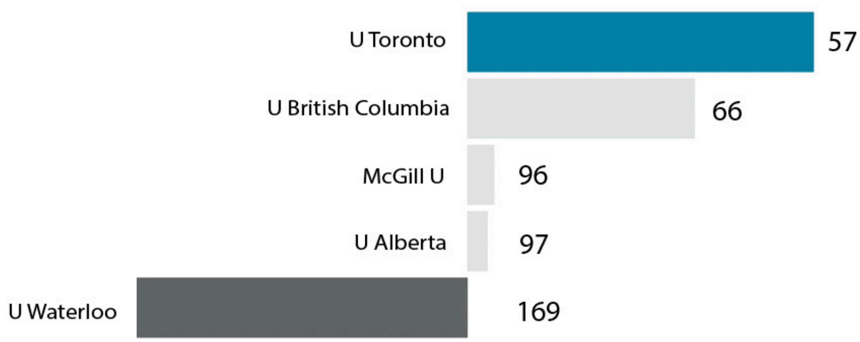


Table 4.16.a Publication and Citation Rankings – Civil Engineering (Clarivate Analytics, 2022)

RA1. Clarivate Analytics Research Area: Engineering, Civil

Engineering, Civil includes resources on the planning, design, construction, and maintenance of fixed structures and ground facilities for industry, occupancy, transportation, use and control of water, and harbour facilities. Resources also may cover the sub-fields of structural engineering, geotechnics, earthquake engineering, ocean engineering, water resources and supply, marine engineering, transportation engineering, and municipal engineering.

Scope notes for Science Citation Index Expanded (SCIE): https://mjl.clarivate.com/help-center
Go to 'Categories & Collections (Scope Notes)' - 'Web of Science Core Collection'

Ranking of the top 20 North American Peers
Please note this includes all faculty at the University of Toronto who publish in this Research Area.
It is not limited to faculty in the Department of Civil & Mineral Engineering.

Note: * indicates a tie

PUBLICATIONS RANKINGS			
Institution Short Name	All North Am. Peers	North Am. Public Peers	Cdn U15 Peers
Texas A&M College Stn	1	1	
Purdue	2	2	
Illinois - Urbana	3	3	
Calif - Berkeley	4	4	
ALBERTA	5	5	1
Texas - Austin	6	6	
BRITISH COLUMBIA	7	7	2
Iowa State	8	8	
Georgia Inst Tech	9	9	
WATERLOO	10	10	3
TORONTO	11	11	4
Florida	12	12	
Penn State	13	13	
Michigan	14	14	
Maryland - Coll Park	15	15	
Calif - Davis	*16	*16	
U Washington	*16	*16	
Mass Inst Tech	18		
Colorado Boulder	19	18	
Michigan State	20	19	

CITATIONS RANKINGS			
Institution Short Name	All North Am. Peers	North Am. Public Peers	Cdn U15 Peers
Texas A&M College Stn	1	1	
Calif - Berkeley	2	2	
Purdue	3	3	
Michigan	4	4	
Mass Inst Tech	5		
Illinois - Urbana	6	5	
BRITISH COLUMBIA	7	6	1
Texas - Austin	8	7	
Georgia Inst Tech	9	8	
Iowa State	10	9	
TORONTO	11	10	2
WATERLOO	12	11	3
Florida	13	12	
ALBERTA	14	13	4
U Washington	15	14	
Penn State	16	15	
Calif - Davis	17	16	
Maryland - Coll Park	18	17	
Michigan State	19	18	
Colorado Boulder	20	19	

Table 4.16.b Publication and Citation Rankings – Geological Engineering (Clarivate Analytics, 2022)

RA3. Clarivate Analytics Research Area: Engineering, Geological

Engineering, Geological includes multidisciplinary resources that encompass the knowledge and experience drawn from both the geosciences and various engineering disciplines (primarily civil engineering). Resources in this category cover geotechnical engineering, geotechnics, geotechnology, soil dynamics, earthquake engineering, geotextiles and geomembranes, engineering geology, and rock mechanics.

Scope notes for Science Citation Index Expanded (SCIE):
https://mjl.clarivate.com/help-center
Go to 'Categories & Collections (Scope Notes)' - 'Web of Science Core Collection'

Ranking of the top 20 North American Peers
Please note this includes all faculty at the University of Toronto who publish in this Research Area.
It is not limited to faculty in the Department of Civil & Mineral Engineering.

Note: * indicates a tie

PUBLICATIONS RANKINGS			
Institution Short Name	All North Am. Peers	North Am. Public Peers	Cdn U15 Peers
Texas - Austin	1	1	
Calif - Berkeley	2	2	
Calif - Davis	3	3	
Illinois - Urbana	4	4	
Calif - Los Angeles	5	5	
BRITISH COLUMBIA	6	6	1
Texas A&M College Stn	7	7	
Penn State	8	8	
QUEEN'S	9	9	2
Calif - San Diego	10	10	
WESTERN	11	11	3
TORONTO	12	12	4
ALBERTA	13	13	5
Colorado Boulder	*14	*14	
Georgia Inst Tech	*14	*14	
Arizona	*16	16	
Stanford	*16		
Northwestern	18		
U Washington	19	17	
Kansas	20	18	

CITATIONS RANKINGS			
Institution Short Name	All North Am. Peers	North Am. Public Peers	Cdn U15 Peers
Calif - Berkeley	1	1	
QUEEN'S	2	2	1
Texas - Austin	3	3	
TORONTO	4	4	2
Penn State	5	5	
Calif - Los Angeles	6	6	
Calif - Davis	7	7	
Arizona	8	8	
BRITISH COLUMBIA	9	9	3
Colorado Boulder	10	10	
ALBERTA	11	11	4
Stanford	12		
Calif - San Diego	13	12	
Illinois - Urbana	14	13	
Georgia Inst Tech	15	14	
U Washington	16	15	
MCGILL	17	16	5
Purdue	18	17	
Texas A&M College Stn	19	18	
Kansas	20	19	

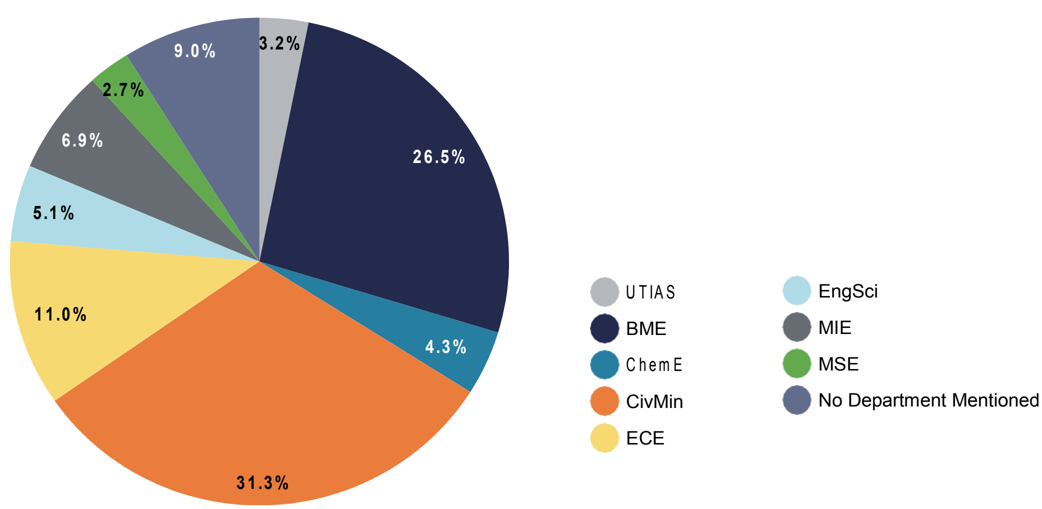
However, an in-house query conducted via Web of Science based on a specific search for papers attributed to our faculty members in the top 10%, and citations by category, year, and document type over the five-year period 2017-2021 produced the following results:

Publication Data:	2017-2021	
Web of Science Publication Count:	1,023	
Total Times Cited:	14,046	
Percentage of Documents Cited:	89.2%	(913)
Documents in Top 1%:	1.0%	(10)
Documents in Top 10%:	11.7%	(120)

4.13 Media Impressions, Publications and Citations

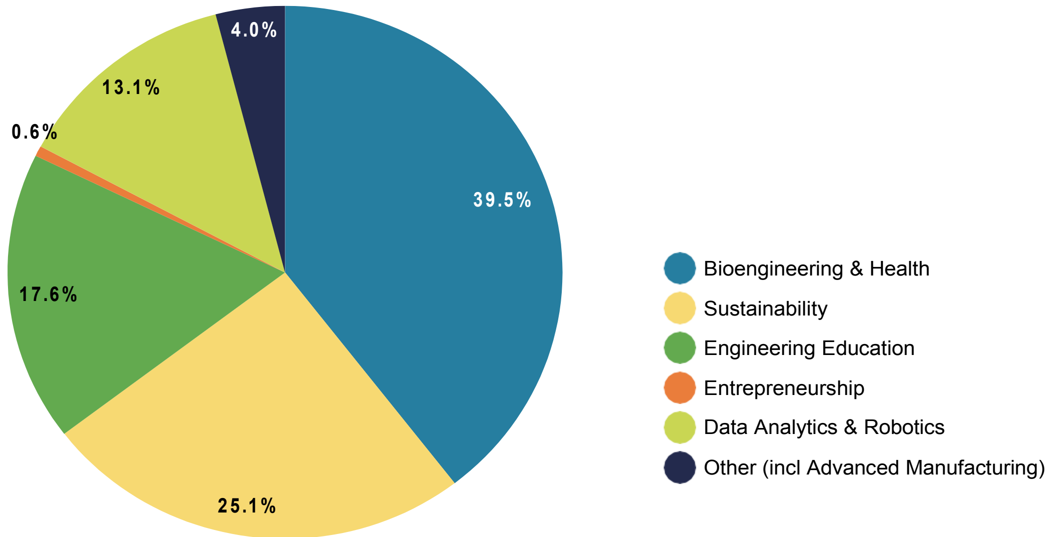
In terms of more general public recognition, the following charts show the proportion of media impressions by Faculty department, and by Strategic Priority Area in 2021-22. We note that the Department of Civil & Mineral Engineering generated the highest proportion of media impressions at 31.3%.

Figure 4.5 Proportion of U of T Engineering Media Impressions by Academic Area, 2021-2022



The Bioengineering & Health Strategic Priority Area led media impressions in 2021-22, understandably due to heightened societal focus related to COVID-19. CivMin professor Jeff Siegel's study of the indoor microbiome and indoor pathogen migration made an important contribution to this. However, the strategic priority area of Sustainability, which is the area most closely related to the breadth of research undertaken within the CivMin department, held the second largest share of public recognition at 25.1%

Figure 4.6 Proportion of U of T Engineering Media Impressions of Strategic Priority Area, 2021-2022



With regard to citations, the majority of researchers working within the fields of civil engineering and mineral engineering usually publish in journals specific to their research foci. For example, researchers working in an area of civil engineering may publish in *Structures* – which is the research journal of The Institution of Structural Engineers, in the international journal *Smart and Sustainable Cities and Society*, or the American Society of Civil Engineers' *Journal of Construction Engineering and Management*.

Researchers working in the field of mineral and mining engineering may choose to publish in journals such as the *Canadian Geotechnical Journal*, *Géotechnique*, the *Journal of Rock Mechanics and Geotechnical Engineering*, *Geological & Geotechnical Engineering*, or *Rock Mechanics and Rock Engineering.*

Although the data provided in the UTQAP Data 2022-23 only generally reflects the standing of our published research in the fields of civil and geotechnical/mineral engineering, we offer the following tables, extracted from the UTQAP data, as the most relevant examples for comparison of our publication and citation rankings in these two fields.

4.14 Student Engagement in Research

Civil and Mineral undergraduate students have many avenues available to them in which to gain in-depth exposure and experience in supervised, project-based research activities. For example, students interested in furthering their in-course research experience can choose to participate in the elective CME499 Individual Project courses, which can be either design or research based. Research based projects require the student to prepare a final thesis and, in all cases, students are required to give a formal presentation detailing their project and process. Also, to some extent the 4th Year CIV498: Group Design Project, and the sequential MIN466/467 Project Design courses both involve elements of research methodology, for example conducting background investigations to inform the development of a solution, collaborating as a team to solve a defined problem, and the presentation of results.

In addition, the Faculty provides summer research opportunities through its Undergraduate Summer Research Fellowship program, the University offers the University of Toronto Excellence Awards (UTEA), and the externally sponsored NSERC Undergraduate Student Research Awards (USRA) program all provide substantive opportunities for undergraduate students to become involved and experience active research. All programs are open to undergraduate students from any program year, with projects and award recipients selected on a competitive basis. The maximum award for all programs is $7,500, with research supervisors providing a portion of the funding. The minimum supervisory contribution is set at $1,500 for the USRA, and at $2,250 for the UTEA.

Students are advised of summer research opportunities and application deadlines via broad outreach announcements generated through our Student Services office, but may also be guided by direct encouragement from a faculty member who assesses the potential for a strong project while working with a student in-course throughout the year.

As highlighted earlier in this report, the following is a tabulation depicting the level of participation of our undergraduate students in the NSERC USRA program over the past six years. Our annual allocation of USRA awards has remained consistent throughout this period, even in summer 2020 when the program was only available on a remote basis due to campus closures imposed by the COVID-19 pandemic.

Figure 4.7 Undergraduate Studies Research Award (USRA) Program – Department of Civil and Mineral Engineering Student Participation 2018 to 2023

2018	2019	2020	2021	2022	2023
17	15	15*	16	15	15

Over and above these competitive programs, each year many CivMin faculty members offer summer research opportunities directly to students who show promise and interest in their respective area of research.

Our professional-stream MEng students have the option to pursue a one or two term project under the supervision of a CivMin faculty member. In this instance, students must predefine their project at the outset of their MEng program, and secure an appropriate faculty supervisor on their own initiative. Our MEngCEM students may opt to apply their four-month internship program component toward undertaking a research position guided by a faculty member.

Our doctoral-stream graduate students are immersed in research from the onset of their program, and have numerous opportunities to enhance their educational experiences through their contributions to published papers, making presentations at conference and symposia, and through attending the many distinguished seminars and special lectures sponsored by the Department. A number of our doctoral-stream graduate students also participate in internships in industry with funding from Mitacs.

In summary, the foregoing overview of our research activities combined with detail of our integral involvement in generating multi-scale collaborative research initiatives is offered to demonstrate that, collectively, our faculty members are firmly committed to identifying and developing new opportunities to increase exposure of our undergraduate and graduate students to meaningful research throughout their higher education experience, that the breadth of our research is both immediate and impactful, and that our shared goal to bring improvement to our varied economic development, planning and policy, and environmental and societal conditions, in order to achieve a more sustainable future, is wholly aligned and directly serves and furthers the University's strategic research priorities and objectives.

5. ORGANIZATION AND FINANCIAL STRUCTURE

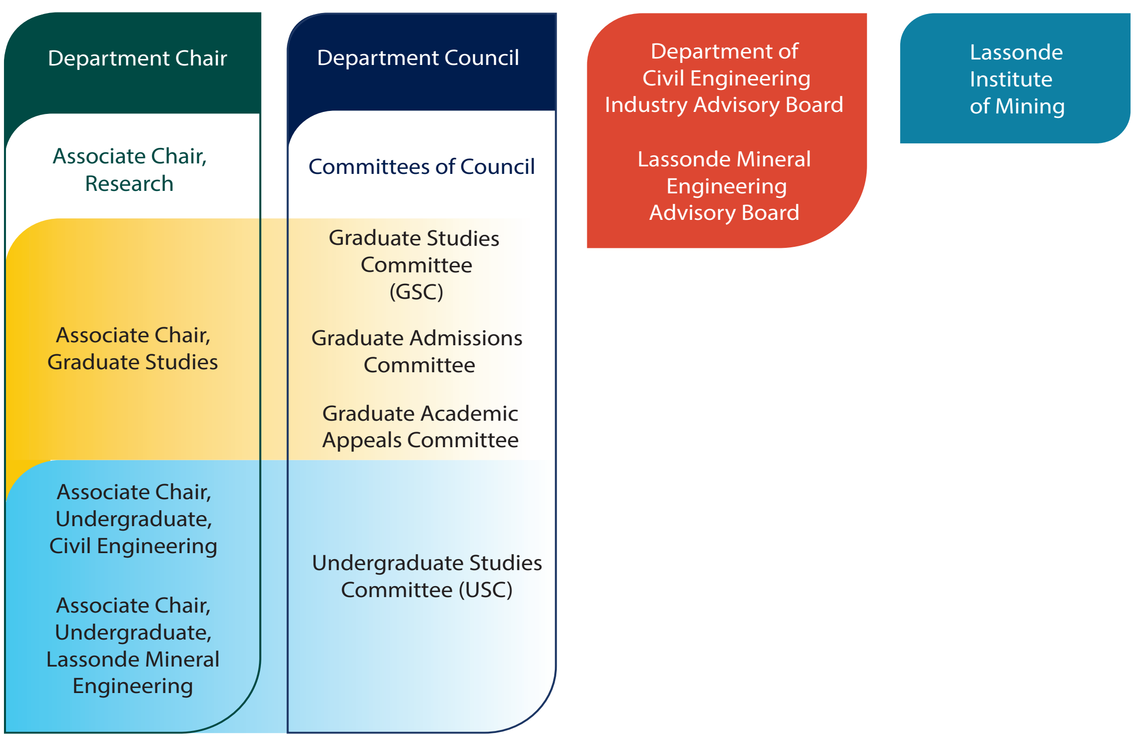
5.1 Governance Structure

The Department's governance and organizational structure is similar to that of other departments within the Faculty and at the University. Our departmental constitution, (copy provided in Appendix E), details our governance structure, the general powers, duties and responsibilities of our Departmental Council, as well as the guidelines governing the structure and function of our four primary standing committees: Undergraduate Studies, Graduate Studies, Graduate Admissions, and Graduate Academic Appeals[1], with academic staff providing full representation in all of these key areas of governance.

In addition, the Civil Engineering Advisory Board and the Lassonde Mineral Engineering Program Advisory Board, each comprised of alumni and representatives from industry, provide input to the Chair in identifying and developing strategic initiatives to further program enhancement opportunities for our students, as well as offering advice and recommendations regarding new trends developing within practice that could be introduced into our program curricula.

A visual representation of our current governance structure is shown in Figure 5.1 below.

Figure 5.1 Governance Structure of the Department of Civil & Mineral Engineering



1 Matters pertaining to undergraduate recruitment, admissions and curriculum are generated from within the Department, but are ultimately approved through the standing committees of Faculty Council and administered through the Faculty Registrar's Office. Matters pertaining to graduate admissions and curriculum are administered and approved directly within the Department and are sanctioned at the Faculty level.

Active ancillary committees of the Department include:

- Honours & Awards Committee which is responsible for reviewing the curricula vitae of our faculty members for consideration of various national and international awards, such as the PEO and CSCE awards

- Graduate Scholarships Committee which is responsible for adjudicating various graduate scholarships, both internal (donations) and external (Ontario Graduate Scholarships - OGS, and Natural Science and Engineering Research Council - NSERC)

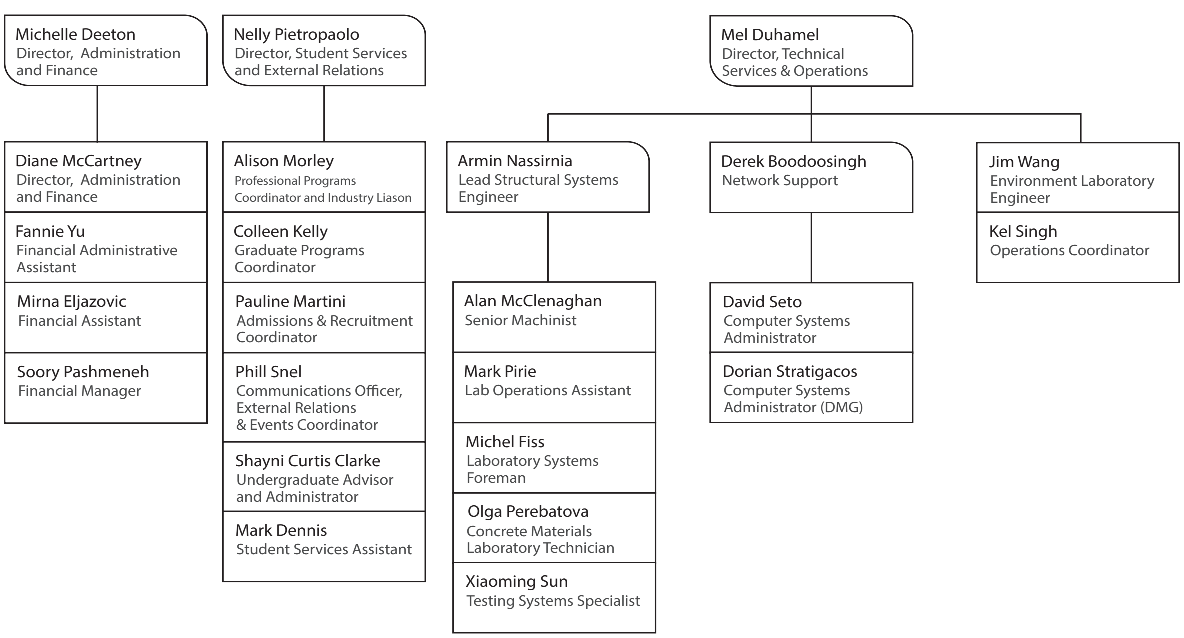
- Space Advisory Committee (SAC), comprised of representatives from departmental leadership and technical services staff, which serves to advise the Chair on facilities related matters of significant or strategic importance to the Department

- Health & Safety Committee, comprised of appointed research and technical staff and responsible for providing oversight on behalf of the CivMin department with respect to health and safety best practices, for apprising our community of upcoming or ongoing events affecting normal operations, and for ensuring that all faculty, students and staff receive the appropriate training and supervision to ensure compliance with regard to the University's health and safety standards and practices within all departmental research groups, administrative units, and student spaces.

5.2 Administrative Structure

The department chair is responsible for overseeing the day-to-day aspects of academic and operational activities, assisted by a team of appointed associate chairs representing the areas of undergraduate studies, graduate studies, and research, an executive assistant, and a team of senior administrative directors who oversee the key areas of departmental operations of administration and finance, technical services and information technology, and student services and external relations. Each of the administrative directors supervise a small team of support staff within their respective area of responsibility. This overarching structure has served the direction of the Department for approximately the past 15 years. Figure 5.2 below depicts the Department's current administrative organizational structure.

Figure 5.2 Organizational Structure of the Department of Civil & Mineral Engineering



5.3 Progress on 2017 Self-Study Review Recommendations with respect to Organization and Structure

The external review conducted in 2017-18 brought forth the following recommendations:

1. With respect to administration, the reviewers indicated there is a need for an overarching departmental strategic plan, which may include an overall mission statement, address undergraduate and doctoral enrolment, and identify international peer institutions.

2. In general, the reviewers encouraged the Department to formalize administrative processes and to improve communications surrounding staff job expectations and performance review. They also recommended conducting a review of needs, gaps, and workload within the staffing structure, especially in the areas of IT and lab support staff.

3. The reviewers suggested increasing alumni and external engagement in advisory boards and improving outreach activities to these groups.

Since then the Department has taken the following actions to address these recommendations.

5.3.1 Departmental Strategic Plan

This recommendation was taken up immediately following the 2018 external review, with ongoing progress being made until March 2020 when operational interruptions associated with the COVID-19 pandemic temporarily derailed the Department's ability to move the process forward. Nevertheless, the planning exercise was revived once standard University operations were reinstituted in September, 2022, and a summary of the analysis and associated action plan will be presented at a departmental meeting in spring, 2023.

The steps taken toward articulating our strategic objectives began with a one-day planning retreat which all faculty and senior management staff of the Department were encouraged to participate in. The retreat was held at an off-campus conferencing centre and was facilitated by an accredited facilitator. This activity served to formulate a structure for identifying our primary goals and key activities, which were anchored to associated performance measures, and organized in categories representing our fundamental operational areas: undergraduate education, graduate education (subdivided under research and professional stream programs), undergraduate and graduate student experience, departmental research, and departmental community.

This structure formed the basis for discussion and development of an action plan/progress report, which we consider to be a "living document" that will be continuously reviewed and updated as the Department moves forward. This part of the process is led by the ad hoc Strategic Planning Committee, comprised of the department chair and associate chairs.

Since the return to regular operations post-pandemic the committee has consistently met on a bi-weekly basis, with each meeting focussing on specific categories.

At mid-point, in February, 2020 a second plenary session was held with departmental faculty to receive feedback on the analysis the Committee had articulated to date, and the input generated from that discussion was incorporated into the first iteration of the strategic plan document. This analysis and development process has continued via the ad hoc committee throughout the past year. In February, 2023 the structure of the document was refined to more clearly demonstrate alignments between the stated goals and key objectives within each operational category, and to facilitate our understanding regarding the progress made on identified strategic initiatives and the ongoing status of same, the actions and key activities identified within each category were funneled into one of two pathways: initiatives underway and planned initiatives. Planned initiatives will move up to "underway" status as we continue through this process.

An updated summary of the strategic plan was brought forward for department-wide discussion in May 2023. Again, the input received was incorporated into the report and a final summary of the Strategic Plan will be fully shared with the CivMin community in mid-summer of 2023[2].

5.3.2 Review of Staffing Structure

The day-to-day administrative and operational activities of the Department are managed through the Technical Services/Information Technology, Student Services and External Relations, and Business offices. The following is a brief synopsis of the steps that were taken to review the staffing structure within each area, and an overview of current conditions.

Technical Services/Information Technology

The Technical Services/Information Technology unit is responsible for handling all matters implicit in its operational designation: managing and facilitating all aspects of technical services related to in-house research and requested through external industry contracts, assisting in the set-up and ongoing management of all IT requirements on behalf of the Department and its affiliated research groups, and managing all aspects associated with mid-level renovations and day-to-day facilities operations.

Reorganizations, to varying extent, have been undertaken within each of the Department's central administrative units over the past five years. The most substantive restructuring was within the Technical Services/Information Technology unit. With the appointment of a new person to the position of Director, Technical Services in 2019 the role was redefined for improved clarity of responsibilities, and to properly delineate the three key aspects of operations attached to the unit. With the creation of another new position entitled Testing Services Engineer in 2023, the Director of Technical Services role was again revised and renamed Director of Technical Services and Operations. This revision coincided with the hiring of a new person for this role, and reflected a portfolio with less focus on the Structural Test Facilities, but with broader responsibilities across the Department.

Throughout, the job descriptions of all existing positions within the unit were reviewed, and a needs analysis served to identify redundancy and gaps relative to current operations. The net result of this exercise was that seven positions were discontinued, nine new positions were created, and four of the existing positions were redefined and, where appropriate, upgraded to better reflect the current level of responsibility inherent to each. This reorganization has, thus far, served the Department very well in that the CivMin community now has greatly improved support services available to them in both of these key operational areas, and the assigned staff are now better equipped and supported in their roles. The current support staff complement rests at twelve positions, seven of which are dedicated to technical services, three positions holding responsibility for IT, and two positions providing support to the director in day-to-day facilities management.

Since reorganization assigned staff have had opportunity to develop and bring more streamlined operating systems on board, and the unit as a whole has accomplished a great deal toward bringing improvement to our internal operations. For example:

In Technical Services:

- facilitating the major renovation underway within the Structures Testing Facility in conjunction with the installation of the new Adjustable Multi-Dimensional (AMD) Loading System
- undertaking a complete clean-up and reorganization of the facilities overall
- improving community adherence to Health & Safety guidelines while utilizing the testing facilities

2 Post-script, May 2023: The Strategic Plan was presented at a departmental focus group meeting in May, 2023 and a copy of the finalized document is now provided as supplemental documentation to this report.

- introducing a new online system for tracking Technical Services charges associated with technician support of research activities

- supporting student activities including student clubs, undergraduate teaching labs, and the University's Gull Lake Camp facility

- improving the outward facing promotion of the Department's Technical Services facilities

- building our outreach to industry partners with a view to increasing collaborations and contract work requiring testing services

Detailed information regarding the facilities and services provided by the Technical Services unit can be viewed on their webpage at Structural Testing Facilities – Department of Civil & Mineral Engineering (utoronto.ca)

Major improvements realized through the Information Technology unit include:

- creating and establishing a workable solution to provide on-line resources in response to the operational shutdowns associated with the COVID-19 pandemic

- creation of a new off-site backup for the department server, thus ensuring security of our administrative and operational data; research groups can opt to purchase space to backup their research data on this server as well, if they wish

- completed a department-wide VOIP upgrade such that voicemail now has digital capability; through this a large number of our faculty have opted to forfeit their landlines, representing an approximate 50% savings for telecom services in our operational costs (currently valued at $26,000 per year); the next phase will be generating to TEAMS as the primary tool for providing voicemail

- creating an IT inventory and asset tracking system; this system is now also being used by some of our researchers for tracking of their own equipment (e.g. UTTRI lends out its transportation monitoring equipment to students and affiliates)

- development of a policy for cost recovery for specialized IT services provided in support of research

An ongoing challenge, impacting the IT group most specifically, is in keeping pace with and adapting to ever changing information technologies and operating systems introduced by the University's central Information Technology unit. The accelerator here is that, although Central IT is working towards developing an eventual central harmonization of U of T administrative systems, from the end user's perspective the development process itself lacks cohesion, with a number of individual IT task forces working in isolation, each focusing on a specific aspect of the University's systems. Consequently, departmental IT staff must work to adapt our IT systems piecemeal. This challenge is exacerbated by a lack of any centralized training for staff that would help end user groups to take best advantage of the various Office365 applications and improve systems integration; the central approach to governing access to the system is by simply blocking certain aspects of the software that in fact could be very useful to the Department (i.e., Grammarly, Planner, IT Risk Assessment are all blocked.)

Conversely, there are several initiatives currently underway at the Faculty level, led through its "FIT" team (i.e., FacultyIT), and working in close collaboration with representatives from all departmental units across the Faculty which will bring improvement to our common internal computing operations, such as facilitating the development of joint soft and hardware purchases (thereby increasing our collective purchasing power) and improving the integration of facility data line runs throughout the "Engineering block" of buildings.

Challenges currently impacting the Technical Services/IT unit overall include completing the hiring process for one of the operations support roles, the onboarding of two recently hired supervisory staff, and the successful completion of several mid-level facilities upgrade projects backlogged by the two phases of COVID-19 facilities shutdowns.

There are also a number of challenges inherent in the University's overarching facilities management structure, especially with regard to inviting departmental input into pre-project consultations concerning renovation projects, which has hampered the Department's ability to obtain accurate information post-project with respect to the hard infrastructure systems servicing our assigned space.

Acquiring adequate funding to be able to procure reliable and up to date replacements for computing and digital display equipment is a challenge throughout. At the moment, the unit is relying heavily on taking advantage of decommissioned/repurposed equipment that is made available through interdepartmental connections. The Department is intending to establish a dedicated annual budget to enable staff to properly plan for timely replacement of equipment, a development that is viewed as a highly desirable factor staff would like to see incorporated into their ongoing operations.

The Technical Services/IT section welcomed a new director in March, 2023 which presents opportunity to reassess the current unit structure, reset priorities, and help address these interdepartmental and operational challenges.

5.3.2.1 Student Services and External Relations

The Office of Student Services and External Relations is most often the first point of contact for members of the Civil and Mineral Engineering community (both internally and externally). The unit is tasked with providing a wide-range of services to the Department and our student body. Briefly, this encompasses creation and management of departmental branding initiatives and the outward facing promotion of our department, our programs and our research, managing all processes associated with student recruitment and admissions, fulfilling all aspects of undergraduate and graduate programs administration, and for providing interactive student advising and career counselling services. Additionally, the unit provides support and advice to our faculty with respect to institutional and departmental academic policies and processes, course and final examination scheduling and organization, aspects of orientation and onboarding to the University's administrative systems (primarily to new faculty and sessional instructors), and for providing full administrative support to the Department's academic governance committees. Further, this office is wholly responsible for generating internal and external outreach initiatives, and managing the coincident coordination of all logistical aspects associated with department sponsored events and external relations outreach initiatives.

The current staffing complement rests at seven support staff, one of which provides generalized administrative support, two positions that are responsible for overseeing all aspects related to communications and for assisting in the management of the Department's community building and outreach initiatives, and four positions that carry distinct and full responsibility for managing the gamut of administration related to our graduate and undergraduate programs. All positions directly report to, and proactively support, the director.

In terms of reorganization within the Student Services and External Relations unit, since our review in 2017-18 two redundant communications positions were discontinued and three new positions introduced: Marketing and Communications Officer, Events Coordinator, and Professional Programs Coordinator & Industry Liaison.

The Marketing and Communications Officer and Events Coordinator work in close proximity, and each has served to greatly improve the Department's outward-facing presence, our approach to internal information-sharing, and the promotion and organization of departmental events. Additionally, although all members of the staff are always willing to help when and as needed, a staff consensus is that the Event Coordinator role in particular has brought significant improvement to the unit's internal operations, providing much needed relief to other staff with respect to eliminating the need to interrupt their focus on their assigned duties in order to "pinch hit" in the organization and/or delivery of departmental events.

The role of Professional Programs Coordinator & Industry Liaison has brought equally significant improvement to operations within the unit. This position has assumed responsibility for overseeing administrative and academic counselling services expressly to our professional stream graduate students, thus improving delivery of services and guidance to this integral and distinct student cohort, while at the same time enabling the partnering role of Graduate Programs Coordinator to dedicate their focus directly to providing services and academic guidance to our doctoral stream students. The additional element of industry liaison attached to this position serves to generate and build relationships with potential employers who may wish to participate in the internship component of the MEngCEM program, while also serving to strengthen our ongoing relationships with alumni working in the field.

A further benefit that has manifested from this instance of reorganization of the Student Services team is that there is now an element of back up available to the three primary areas of graduate programs administration (i.e., admissions, doctoral stream programs, professional programs) from among the existing staff. Providing similar support to back up the undergraduate programs office is an identified priority that all staff agree needs to be addressed in the next phase of office reorganization. In tandem with this, staff have also expressed a collective desire to see improvement brought to the definition and function of the sole general support position attached to the unit, both in terms of bringing clarity to the purpose of the role as well as aligning the duties prescribed to it to more appropriately address current operational needs within the unit.

Notwithstanding the operational challenges inflicted by the COVID-19 pandemic, which called for the unit (as well as the Department as a whole) to quickly create mechanisms for delivery of on-line courses and other academic activities (such as online doctoral student final examinations), and in developing mechanisms for continuing all other aspects of departmental operations remotely, other challenges impacting current operations of the unit include a collective sense of frustration with the methods utilized for internal record-keeping, combined with distinctive limitations embedded in each of the various on-line administrative tools available to them for performing centralized administrative tasks. Moving forward, the staff would very much like to see more streamlining and harmonization of the various shared administrative tools in use across the University (i.e., Quercus, ROSI, Slate).

All staff have noted that the priorities of our students, post-pandemic, have shifted in that there is now a far greater demand placed upon academic advising staff to provide counselling related to mental health issues, and for guidance in accessing appropriate mental health support services. This shift is also evidenced through the notably increased level of student petitions and appeals now being filed with the Faculty's Undergraduate Assessment Committee, and which has significantly impacted the workload of the undergraduate programs advisor. Similarly, the School of Graduate Studies has also seen a significant increase in requests for mental health support from graduate students, to the extent that it has now established the SGS Mental Health Advisory Committee to provide support and guidance to both students and graduate administrators in addressing student mental health issues. Details can be viewed on their website at Graduate Student Mental Health – School of Graduate Studies (utoronto.ca).

While staff feel that they are well supported by the University, the School of Graduate Studies, and the Faculty in terms of being able to respond to this shift in student needs through the wide range of mental health support resources available to U of T students, in addition to availing themselves of all of the professional development resources offered through the University and Faculty, by and large staff feel that there is a disconnect between their defined roles as academic administrators and the expectation to now serve as mental health counsellors. All staff feel ill equipped to be able to respond effectively to the growing need for this type of support on a day-to-day basis. Nevertheless, it is a testament to their collective dedication and abilities that opinion and support of the unit staff is consistently highly regarded and valued by our students.

A substantial and taxing challenge, which will undeniably impact the organization and future operations of the Student Services and External Relations Office, is the imminent retirement of the unit's long-standing director. To date, and for more than twenty years, the Department has been extremely fortunate to have been able to rely on the unwavering dedication and tireless leadership of the incumbent. Their retirement will initiate a significant transition within the unit, and while the timing of this transition is not yet fully idealized, a review and reorganization of the director's role will spearhead the next phase of reorganization within this key operational unit.

5.3.2.2 Administration and Finance

The Administration and Finance office (aka the "Business office") is responsible for managing all administrative and financial functions attached to the Department, which includes oversight of the operating budget, managing the accounting for an appreciable number of complex departmental research grants and several special project accounts (i.e., for new initiative projects supported through the Dean's Strategic Fund and various seed programs such as ExSeed, EMHSeed, IWISeed, etc.), and for facilitating the financial administration of all individual faculty research funds. The administration and reporting for Tri-Council sponsored research funds in particular have become notably more complex over time.

This unit is also responsible for managing the full spectrum of administration related to human resources, such as payroll processing for all constituents of the department, facilitating recruitment and hiring processes (post-doctoral fellows, research associates, project managers, casual staff), and managing the on-going tracking of all employee records.

Staff have noted that the workload related to the human resources functions provided through the unit has increased significantly of late. This is conceivably largely due to the new initiatives emerging within the Department's research portfolio that have generated a number of new staffing positions, all of which require individual advice and unique elements of support. All have differing needs and situations that require a wide range of remedial approaches and unique problem solutions.

Nevertheless, the structure and staffing of the Administration and Finance office has consistently served this aspect of departmental operations fairly well, requiring only minor organizational restructuring over the past five years. One position was redefined to provide a greater amount of dedicated support toward research fund administration, and one redundant and somewhat misaligned position was discontinued. A few of the overarching responsibilities that were attached to this redundant position, which upon review were actually more facilities-based in nature, were incorporated into one of the new positions created during the restructuring of the Technical Services and Information Technology unit. The total staffing complement now rests at five support staff, all directly reporting to and supporting the director.

The administrative support now expressly dedicated toward research fund administration has greatly helped to improve the day-to-day operations within the unit, as well as improving the timeliness of delivery of services to all members of the CivMin community. Under new leadership, instituted at the time of our last external review, the unit has greatly improved the level of transparency with respect to financial matters, which in turn has served to build renewed confidence and improved relations between the unit and our community. There are no plans for any further restructuring within this portfolio in the short-term.

However, from the staff's perspective there is still much work to do in terms of improving community relations and interactions, as the value of the services provided by the unit to the broader departmental community is still not well understood. Perhaps the greatest challenge for the unit is in achieving "buy-in" from all department constituents in terms of adhering to or following U of T's best practices with regard to finance and administrative matters, in spite of the unit staff's best efforts to provide training and issue reminders requesting required documentation, or advising of processing deadlines.

Other challenges impacting the unit are primarily centred in the limitations of the University's centralized administrative management system (AMS), which at this point in time does not provide the appropriate tools for some aspects of financial processing, for example the issuing of expense reimbursements and reconciliation of purchasing card statements. In both cases much background work needs to be done in order to prepare these items for processing, and in CivMin's case this requires the dedicated focus of one full-time staff person overseeing these two functions primarily to ensure that financial entries are recorded and accounted for correctly within the AMS system. Additionally, some AMS-system modules don't allow deviation from pre-set accounting parameters, and these pre-sets often do not align well with the full range of current expenditure categories, especially with respect to expenditures related to research. As a result this requires some manoeuvring within the system, often calling for several transactions to be generated to ensure that the Department remains compliant with these centralized processing parameters, an inefficient and somewhat time-consuming process.

Some of the initiatives undertaken within the unit over the past five years include establishing improved mechanisms for record-keeping and document management, formalizing the process for record-keeping related to purchasing cards, the roll-out of an internal on-line system to capture recoveries for IT and technical services provided to research units by the Department, and securing approval to allow the elimination of an outdated refundable deposits program, which was unnecessarily time consuming and an ongoing source of frustration for all members of the CivMin community.

Moving forward the unit plans to resume an internal program for educating departmental constituents with respect to U of T processes (this was disrupted by the COVID-19 pandemic), develop a series of training presentations and more formalized educational tools to help with the orientation and onboarding of new staff, undertaking a review of all current administrative processes to eliminate redundant or unnecessary processes, and working closely with the Faculty's finance office and cognate department counterparts to identify ways to improve or streamline various business processes.

5.3.2.3 Summary of Review of Staffing Structure

In summarizing the restructuring that has taken place since our last external review in 2017, the Department's administrative structure comprised a total of 26 positions, with four of these classified as "professional/managerial" and 22 classified as unionized administrative support. The Department's current administrative structure comprises a total of 28 positions, with five of these classified as "professional/managerial, and 23 classified as unionized administrative support. This represents a net increase of two positions overall over the past five years. However, it is also to be noted that one of the (IT) support positions is time and cost-shared with one of our leading research groups on a 50-50 basis.

With regard to the overall structure and administrative processes of the Department, there are three factors that have been touched upon by each unit unilaterally that constitutes a general consensus with respect to hoped for future directions. The first is a strong desire to see greater support for both the creation and the utilization of more robust on-line administrative tools that will better help to streamline administrative processes and improve internal record-keeping. Another is an expressed desire to undertake a cohesive, joint review of the Department's current administrative structure, with a view to affecting an organizational restructuring from the perspective of the administrative units as a whole, rather than as distinct operational units, as staff feel that there may be new approaches to the administrative structure that would better serve the current needs of the Department.

The third is the establishment of a position that would be singularly identified as the Department's onboarding agent for all new hires (i.e., faculty, sessional instructors, and research and administrative support staff) as well as fielding queries from existing faculty and staff on various operational procedures.

There are several administrative functions that could be incorporated into this role that could serve to provide relief and improve the ongoing functioning of several positions as well. These include the annual undergraduate and graduate course scheduling process, the hiring and tracking of TA assignments each term, and the calculation, processing and tracking of doctoral stream student funding packages. All of the above have been offered by staff as suggestions for consideration in conjunction with any future reorganizational exercises.

In closing, there is one aspect of the administrative complement that deserves its own signalling. This is the lone role of executive assistant to the chair. Although the role is distinct, the day-to-day activities that are entrusted to the incumbent intertwines with the work performed among all of the Department's administrative units, and involves providing services to the full spectrum of departmental constituents. The workload is significant and broadly dispersed, and the incumbent has put forward a consistent effort to keep pace with the unrestrained demand. We therefore highlight that the above-mentioned onboarding agent position would help to bring much needed relief to this role, especially with respect to facilitating the onboarding of new faculty hires and sessional instructors.

5.3.3 Advisory Boards

The Chair seeks advice on matters related to emerging research directions, identifying potentials for collaborative research opportunities, the timely introduction of new technologies and best practices into academic program content, and furthering our student experiential learning and educational support initiatives through two distinct advisory boards. The Civil Engineering Industrial Advisory Board consults on matters specific to our Civil Engineering programs, and the Lassonde Mineral Engineering Advisory Board likewise provides advice specific to the undergraduate LME program.

The Civil Engineering Advisory Board is a long-standing departmental entity, composed of representatives from both our Civil Engineering alumni base and our industry partners, while the LME Advisory Board is a recently instituted entity. Our initial objective in establishing the LME Advisory Board was to seek input and draw upon the practical experience of mineral engineers as they enter and build their professional careers, as we viewed this as most relevant and essential to helping our LME students assess their own future career opportunities. As such, the current composition of the LME board has been enlisted wholly from our LME alumni base, generally from among those who have graduated within the last fifteen years.

To date our advisory board members have contributed to our mission through participation in numerous departmentally-sponsored career panels, discussion groups, career fairs and events for students, providing feedback to our junior faculty with respect to their research directions, and providing junior faculty with qualitative connections in industry to help establish and further their collaborative research efforts. As the University embarks on its ambitious “Defy Gravity” campaign we will seek guidance from our advisory boards toward developing effective strategies for growing student educational support, strengthening our academic programs, and building upon our community outreach efforts.

5.4 Budget

The University’s approach to budgeting is ostensibly a transparent process, with funds allocated to the Faculty on the basis of actualized, or attributed, earned revenues and forecasted operational costs. The Dean’s office determines the key values for revenue earned and associated central costs, and once these are set departmental revenues are factored based on student count, faculty FTE allowance, research overhead, endowment income, and income earned via Canada Research Chair allocations. The amount attributed to each revenue source is based on data compiled from the previous year.

In 2022-23, sources of “Attributed Operating Revenues” included the following factors:

- Student Tuition and WGU income
- Teaching Budget revenue
- Cross-Faculty Teaching Redistribution
- ISTEP Graduate Teaching
- Inter-Departmental Graduate Student Redistribution
- Mathematics & Physics Teaching Redistribution Credit
- Allocation for Academic FTE
- Endowed Chairs Budgeted Revenue
- Canada Research Chairs
- Total Research Overhead

Adjustments then made to the above, included:

- an allocation for administrative costs associated with central Research Services
- an allocation for Occupancy Costs as determined by central administration
- a redistribution of the income associated with Endowed Chairs
- a redistribution of the income earned via Canada Research Chairs

Final adjustments incorporating additional revenues included the following factors:

- Faculty Fund Allocation
- Graduate Incentive Program
- Other Adjustments (if any)

The attributed operating revenue amounts are determined through a simple calculation of hard numbers multiplied by a verifiable parameter (such as student count x weighted graduate unit to derive revenue earned through government student-based transfers). While we can easily forecast our annual revenue for the majority of the attributed revenue sources during our annual budget planning process, there are two sources that are somewhat more discretionary, the "Allocation for Academic FTE" and "Total Research Overhead". While determination of the allocation for academic FTE is largely controlled at the Faculty level, research overhead is solely determined through departmental faculty performance in research. In short, the more success we achieve in attracting research sponsorship contracts and grants, the greater our revenue from research overhead. Likewise, when our research activities ramp downward, our research overhead is diminished in the following year's budget. This fluctuation can present a substantial challenge to the Department in any given year, as a decrease in research overhead generates a shortfall in our overall operating budget, which then needs to be covered through various other mechanisms such as deferring planned projects, cutting back on extra-departmental activities, or suspending staff hiring activities.

Based on our consistent performance in successfully securing research grants and industry contracts over the past five years, our base benchmark for revenue generated through research overhead is approximately $2.5-million per year. In 2022-23 the Department exceeded this, earning a total of $2.84-million in research overhead, representing approximately 14.78% of our gross attributed revenue.

The Department shares this income from research overhead with our faculty on a 75/25 basis. We determine the net amount available for distribution by subtracting the amount charged by Central Administration for research services costs from our gross total research overhead. Then 25% of the net amount is allocated to individual faculty members based on the research overhead attributable to their research contracts. Faculty members who do not bring in contract research overhead do not receive research overhead returns, hence providing an incentive to faculty members to proactively further their research support from industry.

The redistribution of research overhead is discretionary, in that the Department has the authority to adjust the ratio of share from year to year, and its known that the practice in some departments is to retain all of its attributed research overhead exclusively for departmental uses. In the case of the Civil and Mineral Engineering department, we have not exercised this option for at least the past 15 years, preferring to retain the practice of sharing this income on the basis of the standard 75/25 split, and making any necessary adjustments to account for budget shortfalls via other mechanisms.

In 2022-23 the Department's net operating budget amounted to $15,241,288, of which 92.77% was allocated toward salaries and benefits for all staff categories, (i.e., faculty, appointed and casual staff, sessional lecturers and TAs), 2.62% allocated towards graduate fellowships, 2.05% allocated to basic operating expenses (such as facilities renovations, furniture, office equipment and supplies), 1.41% allocated to disbursement of research overhead, and the remaining 1.15% allocated to student club support, departmental hospitality and sponsored events, and Survey Camp operating expenditures (largely for food services.)

However, over the past five years the Department has seen a significant decrease in its annual operating budget, as shown below:

Table 5.1 Department of Civil Engineering 5-Year Comparison of Operating Budget FY2019-2023

Budget Element	FY19	FY20	FY21	FY22	FY23	5-Year Differential
Total Attributed Operating Revenue	18,757,792	17,605,130	17,797,099	19,260,801	19,260,411	502,619
LESS: Total Adjustments to Revenue	-4,022,074	-4,257,849	-4,606,666	-4,964,592	-5,248,988	-1,226,914
Net Budget	14,735,719	13,347,281	13,190,433	14,296,209	14,011,423	-724,296
Approved Department Revenue/Recoveries						
Endowed Chairs Income	788,000	635,000	614,000	657,000	672,000	
Canada Research Chairs Income	240,709	240,709	234,994	387,865	387,865	
Transfers from Faculty	0	0	0	0	0	
Other Revenues	415,500	438,600	420,000	370,000	170,000	
Gross Expense Budget	16,179,928	14,661,590	14,459,427	15,711,074	15,241,288	-938,640

The key elements that have adversely affected our operating revenues include:

1. Provincially imposed freezes on potential revenue sources such as domestic tuition, in combination with a decrease in the amount of funding provided through provincial operating grants over the past three (as well as the upcoming 2023-24) fiscal periods, and following a 10% reduction in domestic fees imposed in 2019-20; Our ability to increase revenue through increasing enrolments is somewhat limited, as domestic student enrolment is actually capped under the University's Strategic Mandate Agreement with the Province of Ontario. To a certain extent this is also hampered by a lack of physical space available on campus in which to grow programs. Nevertheless, the Department has increased its first-year target for the Civil Engineering undergraduate program by an additional 15 students for Fall 2024.

2. Compounded increases in the central Research Services cost, which has grown from $682,690 in FY2019 to $1,026,720 in FY2023. Some of this increase could be attributed to an increased level of research activity within the Department, requiring review of a greater number of research proposals and/or the creation of additional research accounts, but to date we have not seen any substantive increase in the services provided relative to this.

3. Compounded increases in our annual Occupancy Cost, which on average have gone up by five per cent year-over-year (ranging from between one to eight per cent each year) factored on the cost per NASM, which without any significant increase to the amount of space assigned to the Department, has grown from $363/NASM in FY2017 to $474/NASM in FY2023.

4. Decreases in the FTE allowance for faculty members. The amount available for distribution is determined at the Faculty level, with the divisor based on the total FTE count across the Faculty. As additional faculty hires are made, either at the Faculty level or within individual departments, the divisor factor in turn increases, resulting in a diminished share of the disbursement pool overall. To help departments cope with shortfalls in anticipated operating revenues associated with this (which ultimately have to be made up by drawing from other sources of revenue) it would be useful if the Faculty could establish some form of guideline detailing its faculty hiring projections.

5. In FY20 a new line item, "ILEAD MEng Instruction", was introduced to our attributed operating revenue. This element serves as a means for redistributing funds to FASE's Troost Institute for Leadership Education in Engineering (Troost ILEAD) as compensation for costs related to their MEng program enhancement courses. This is represented as a negative on our accounting side.

In the first year of redistribution, this amounted to a decrease in the Department's attributed operating revenue of $52,875. In the ensuing years the Department saw this figure compound and grow to a total of $91,842 in FY22, and although the Department's contribution was reduced to $73,674 in FY23, to date we have no understanding as to how the departmental amounts are factored, and therefore have no reliable formula for forecasting an estimate for our budget planning purposes.

Indeed, approximately 40% of the line items comprising our Attributed Operating Revenue are determined outside of the purview of the Department, which hinders our ability to effectively forecast a quantitative annual operating budget each year.

Although the University has seen significant growth in revenues over the past few years, it is certain that there will be additional adjustments made to the annual budgeting process as the institution strives to recover both from revenue losses and increased expenditures related to COVID-19, continuing escalations in operating costs, increased competition for Tri-Agency research funds across academia, and the substantial fluctuation/escalations in the rate of inflation.

One such adjustment recently imposed is that, in the past, departments were allowed to carry forward unspent funds from year to year, which could then be applied towards new projects and initiatives. This has now been amended so that the maximum amount of carry forward funds that departments may now retain cannot exceed 10% of their gross operating revenue.

In view of these existing and pending adjustments, the Department is now in the process of identifying new sources for generating revenue and decreasing costs to help offset what we expect will be further reductions in our attributed operating revenue. Some of these strategies include:

- increasing engagement with industry with a view to increasing service contracts
- increasing enrolment, especially with respect to our professional stream graduate programs
- increasing research funding, ergo increasing earned research overhead
- expanding the pool of recoveries associated with the Department's provision of technical services
- exercising greater control over ad hoc expenses
- continuing our advocacy efforts with respect to reducing the amounts charged for centralized occupancy and research costs

6. RESOURCES AND INFRASTRUCTURE

All buildings and infrastructure at the University is centrally owned and administered, with the various resident faculties, schools and institutes assigned an appropriate segment of campus space in which to mount their research and academic programs. The guidelines for allocation and utilization of space are determined in accordance with the categories and specifications identified and recommended by the Council of Ontario Universities' (COU) Committee on Space Standards and Reporting. Their factor for providing guidance in determining the appropriate space allocation within a specific category is predicated on net assignable square meters (NASMs). NASM is defined as the amount of area which can be used by the occupants of the building. It is the sum of all areas on all floors of a building assigned to, or available for assignment to, an occupant, including every type of space functionally usable by an occupant (with the exception of Custodial, Circulation and Mechanical areas).

In the case of the Faculty of Applied Science & Engineering, a total of 71,914 NASMs are allocated for distribution among its cognate engineering units. Of this, the Department is currently assigned 8,118 NASMs of teaching, research/laboratory, student support, and administrative space, representing 11.3% of total Faculty space.

Figure 6.1 Summary of Buildings Occupied by Engineering, 2021-2022

Code	Building	Office of the Dean	EngSci	UTIAS	ChemE	CivE& MinE	EcE	BME	ISTEP	MIE	MSE	Total NASMs
AS	Aerospace (Downsview)			5,292								5,292
BA	Bahen Centre	1,581	561		67		5,529			1,668		9,407
DC	Donnelly CCBR				667			889				1,556
ES	Earth Sciences				164							164
EA	Engineering Annex	221					944				91	1,256
EA	Electrometal										149	149
FI	Fields Institute	332										332
GB	Galbraith	1,505				5,312	4,318		55			11,190
HA	Haultain				198	110				727	721	1,755
M2	MaRS West Tower						136	791		183		1,110
MB	Lassonde Mining					1,138		1,362		1,890	832	5,222
MC	Mechanical Engineering	63								5,384		5,447
MY	Myhal Centre	5,228							579			5,807
PT	D.L. Pratt						1,327			2,231	1,488	2,815
RS	Rosebrugh							939				3,170
SF	Sandford Fleming	629		692		1,559	3,546		137			6,563
WB	Wallberg	375			8,264		130				1,381	10,151
RM	256 McCaul	528										528
	Total Area	10,462	561	5,984	9,361	8,118	15,931	3,981	771	12,084	4,662	71,914

71,914 NASMs (Net Assignable Square Metre)

In 2022, the Department contributed approximately $3.6-million, or 28.2% of its gross annual budget in flow through occupancy costs for access to these resources. In addition, the Department is responsible for ensuring the ongoing maintenance of the infrastructure, and for any development costs associated with the renovation and/or upgrades made to these facilities. As many of the buildings and facilities on St. George campus are now well aged and require multiple aspects of infrastructure renewal, we do see a cumulative escalation in both the amount of our annual occupancy cost and its relational percentage of our budget, as well as the amount of operating costs we must direct toward the maintenance and upgrading of these facilities. This is an ongoing challenge for the Department.

Our 2017-18 Self-study presented us with the following recommendation from our external reviewers:

"The reviewers identified variances in the quality and quantity of space available to faculty and students and in communication about decisions regarding space. The reviewers recommended establishing a "Space Committee" to establish a strategic space plan and to seek ways to improve communications surrounding space decisions. "

The Department has proactively acted on this through re-activating its Space Advisory Committee (SAC), comprised of representatives from departmental leadership and technical services staff, and updating the committee's terms of reference to better assess the appropriateness of how resource allocation has been managed, including space and infrastructure support. Additionally, in September, 2019 under the direction of the department chair and our (then) director of Technical Services, Loreto Caprara, the committee also undertook a thorough examination and evaluation of all departmental space. The resulting report "Management of Space and Infrastructure" remains under discussion among the various departmental constituencies, although some of the key findings contained in that draft report are incorporated herein.

The SAC has identified that, as there are no substantive opportunities for acquisition of additional space foreseeable in the near future, it will be more fruitful to endeavour to accomplish space maximization through consolidation and intensification. This will be the primary focus of the committee over the next few years. In the interim, to ensure fair assignment of space in a space-constrained system, as well as optimal utilization of space as the foci of our various constituents' changes over time, the Department adheres to guidelines set out in its "Policy on the Management of Departmental Space". This policy details the governing principles concerning space allocation and the process for determination of spatial assignments. A copy of the policy is attached in Appendix F.

At present, the Department occupies space dispersed throughout the Galbraith (GB), Sandford Fleming (SF), Haultain (HA) and Lassonde Mining (MB) buildings. The facilities in this space primarily comprise a range of laboratories to support the various thematic areas of our teaching and research portfolio: structural, building science, concrete materials, mining and geomechanics, transportation engineering and planning, and environmental engineering.

Although laboratory facilities are usually identified as either dedicated teaching or research space, the increasing demands of a growing curriculum, combined with growing student populations has made it necessary for the Department to continuously double-up on space utilization, such that laboratory facilities are frequently used for both research and teaching activities. Where necessary, the Department also negotiates for access to additional laboratory facilities available through cognate departments, such as the Fluid Mechanics laboratory located in the Wallberg Building and operated by the Department of Chemical Engineering & Applied Chemistry (used for CME270), and the Chemistry Department laboratories located in the Lash Miller Chemical Laboratories building (used for CIV342, CIV1308 and CIV1319).

6.1 Departmental Research Facilities

Existing laboratory resources include:

- the Structural Testing Facility, located in the basements of the Galbraith and Sandford Fleming buildings, a unique structural engineering facility that enables researchers to perform experiments on large-scale structural and mechanical components, as well as conduct full scale destructive tests under impact and high velocity loading conditions (this laboratory is networked to partner facilities located at École Polytechnique de Montreal, Sherbrooke, and McGill universities)[1]

- the Concrete Materials Laboratories located in part in the basement and primarily on the third floor of the Galbraith building are equipped to perform a wide range of tests on concrete materials and to provide training at both the graduate and undergraduate levels. Specialized research equipment in the laboratories include numerous devices for characterization of the properties of concrete. The section of the lab located in GB31 is also equipped with a dedicated dust extraction system and safety sub-systems (i.e., eyewash stations, deluge shower, etc.) as well as an overhead crane to assist in servicing the lab's sedimentation system.

- the Geotechnical Laboratories, located in GB312 and GB313, are designed for combined teaching and research purposes. These laboratories are equipped to perform standard tests on soil, rock and concrete materials and to provide training at both the graduate and undergraduate levels

- the Environmental Engineering research facility is a joined suite of labs located on the fourth floor of the Galbraith Building

- the Intelligent Transportation Systems Laboratory (ITS lab), housed on the third floor of the Sandford Fleming Building, is a graduate research facility dedicated to generating simulations and for traffic monitoring based in real-time data (this lab is also made available to undergraduate students involved in transportation research)

- the Rock Fracture Dynamics lab, located in the Sandford Fleming building, is an integrated rock testing facility with geophysical monitoring and extensive numeric modeling capabilities. The adjacent Structural Remote Sensing and Data Visualization lab is utilized to monitor the performance of components of structures and bridges

- the Building Energy and Indoor Environment research facilities, located in the basement of the Sandford Fleming building, provide access to climate simulators and data acquisition, as well as ample space to set up full sized wall sections for testing

- the Building Science Twin Suites complex located on the roof of the Sandford Fleming building provides unique facilities for research on building systems and indoor air quality

- the Haultain laboratory (HA53), is used for both undergraduate structural mechanics and geomechanics laboratory exercises

The labs are supported by three shop facilities for machining, woodworking and welding. Each shop is equipped with tools and equipment to facilitate development of prototypes for course related student projects and research projects. Further details regarding our key research facilities can be found on our website at Department of Civil & Mineral Engineering Research Facilities (utoronto.ca).

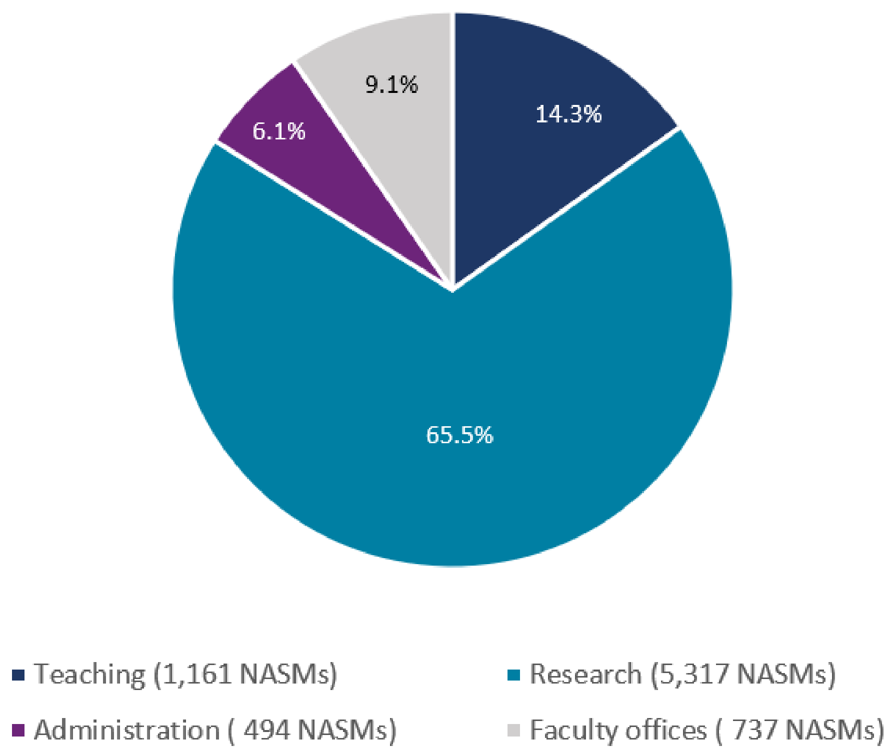
Teaching facilities dedicated to departmental use include the classrooms located in GB117 and GB217, and the Goldcorp Mining Innovation Suite, a unique grouping of study spaces located on the fourth floor of the Lassonde Mining Building. This space contains several design studios, individual graduate workspaces, a conference room, and

1 This facility is currently undergoing renovations, detailed below.

a special event reception area. The design studios are fully equipped with integrated presentation equipment, banks of computers to aid group design projects, and board style meeting tables to facilitate group discussion. When not being utilized for student or teaching purposes, the Goldcorp facility also serves as a conferencing centre for department-sponsored guest seminars, staging of the public component of our PhD departmental examinations and MASc thesis presentations, and for alumni events and advisory board meetings.

Additional departmental spaces include faculty and administrative offices, student study and club spaces, administrative support facilities, and a small amount of storage space. The following chart depicts the allocation of assignable departmental space by category, with research space comprising the greater portion of total departmental space. We note that shared student club and departmental ancillary space is not factored into the chart, although each represents approximately 2.5% of our total space allocation (comprising 218 and 193 NASMs respectively, or approximatly 5% in total.)

Figure 6.2 Allocation of Departmental Space by Category



6.2 Safety Management System

To aid all members of the CivMin community in identifying departmental resources and securing access to relevant facilities and services the SAC, under the direction of the Department Chair and our Director of Technical Services, and with input from the department Joint Health and Safety Committee, developed an intranet-based Safety Management System. This system serves as a scalable framework for meeting our legislated and institutional requirements, promotes proactive and real-time documentation, and helps to further a culture of safety within the department. The "CivMin Health and Safety" Microsoft Teams group is a highly integrated component of this system, which is often used as an "emergency broadcast system" to send safety alerts, work on engagement, or relay important information about impacts to our campus experience.

6.3 Facilities Projects Completed 2018-2022

Much of the work that had been scheduled for facilities upgrade and/or renovation was temporarily delayed due to institutional closures related to COVID-19, and we are now endeavouring to resurrect and move these projects forward. Nevertheless, the Department has successfully completed the following projects on the U of T campus since our 2017-18 Self-study report:

- reactivation of the departmental Space Advisory Committee
- completion of an analysis of all CivMin facilities
- creation of an accessible, on-line departmental space inventory
- development of the Geomechanics facility in GB312
- development of the Concrete Materials laboratory in GB31
- development of the Mining Water and Environment facility in GB412
- development of the Building Energy and Indoor Environment testing facility in the Sandford Fleming building
- initiation of major renovation of the Structural Test Facility space in the Galbraith Building (see below)

6.4 Gull Lake Camp Facility

In 2020 the Department undertook a major development and infrastructure renewal project at the University's Gull Lake camp facility. The camp, located near Minden, Ontario is utilized to host our annual CME358H – Civil and Mineral Practicals (CAMP). The CAMP course provides undergraduate students with the opportunity to acquire hands-on experience in the use of various field instruments used within their professions, and the processes involved with land surveying, water quality measurements, hydrologic measurements, and alternative energy system related measurements. Held in August of each year, each camp session is two-weeks in length, with two camp sessions normally run. We also access the camp for three days in early September each year to run CIV201: Introduction to Civil Engineering. In this course, students learn about water and wastewater systems, hydrology, and biodiversity.

Originally built in 1920, the Camp facility was in dire need of updating. Through a robust fundraising campaign spearheaded by Professor Emerita Brenda McCabe, combined with a generous contribution from the Faculty via the Dean's Strategic Fund, and major donations from contributors such as the Heavy Construction Association of Toronto (HCAT), and numerous alumni, the Department raised funds sufficient to replace the exiting bunkhouse with a completely new facility that can accommodate up to 96 students at a time. Upon completion the bunkhouse was officially named the HCAT Bunkhouse. In addition, the project included development of a new flexible-use common room named the MacGillivray Common Room, and new washroom facilities. The project scope also included installation of a new on-site wastewater sewage treatment system.

Although the Camp is an acknowledged University property, the Department has continually contributed towards the maintenance and upgrading of the facility over the years. We see this as one aspect of our contribution to the University community as a whole. For example, several years ago the Department upgraded the staff accommodations to respond to a need to increase the space available to house the teaching support staff. There is now accommodation to house four instructors and four TAs within one facility. We also upgraded the adjacent washroom facilities at that time.

The camp facility is also used by the Da Vinci Engineering Enrichment Program, (more commonly referred to as the DEEP Summer Academy), in June and July each year. This partnership works very well as, in the past, the program has contributed towards the cost of several major upgrades to make the facility safer for younger student groups.

Although the camp was available for use in time to host our Survey CAMP activities in summer 2022, the Department is presently addressing several construction deficiencies. However, we are confident that these setbacks will be adequately addressed in time for the camp to be fully operational once again by summer 2023.

6.5 Projects In-progress

Structural Testing Facility

Through the award of a major CFI Innovation Fund 2020 grant secured by CivMin faculty member and project lead Professor Constantin Christopoulos, (Canada Research Chair in Seismic Resilience of Infrastructure) in combination with donations from our alumni amounting to a total project fund of $16.5-million, the Department is in the midst of undertaking a major renewal project to upgrade and re-equip the Structural Testing Facility located in the basement of the Galbraith Building. The centrepiece of this project is the installation of the world's first fully movable, adjustable, multidirectional, large-scale and large-capacity loading frame, which will allow structural elements and structural systems to be tested under more realistic loading conditions. The preparatory work required to properly house this new equipment has been significant, involving the repositioning of the Shell Element Tester (a 60-tonne steel frame with 40 hydraulic actuators), the decommissioning and dismantling of a large-scale (and outdated) universal testing machine, the demolition and removal of the existing reinforced concrete strong floors, machine base and foundation walls, and the replacement of same with a new, heavily reinforced strong floor.

Upon completion, the project will also include new state-of-the-art sensing equipment and the redesign of 500 square metres of lab space to accommodate the research of ten professors from U of T. The facility will also be utilized by researchers from several other national and international collaborating institutions including the universities of British Columbia, Sherbrook, and Illinois, Polytechnique Montreal and Western University's WindEEE and Boundary Layer Wind Tunnels. It is also expected that the facility will allow accommodation for a range of unique graduate student research projects and industry tests throughout the year once it is fully operational. We anticipate that this new facility will be available for use by mid-year, 2023.

Building Resilient Adaptive Community Environments (BRACE) Laboratories

Another major renovation project currently under consideration is the development of two highly specialized laboratories that will facilitate research in building science and air quality, especially as relates to the impacts of climate change on and within Canadian built environments.

Professor Jeffrey Siegel is spearheading a multidisciplinary initiative that will bring approximately 20 researchers from across the University together through the Building Resilient Adaptive Environments (BRACE) platform to simulate and assess the more extreme meteorological and environmental conditions expected to come. Areas of focus include studying the impacts of indoor air on cognitive functions (such as learning and decision-making), design and testing of climate resilient infrastructure and materials, development of improved building ventilations systems, and establishing national guidelines for air filtration used in homes and businesses. Key to the success of the initiative is the creation of the Contained Climate Chamber Facility (CCCF) and the Building-Occupant Response Laboratory (BORL).

It is proposed that these two unique and futuristic labs will be contained within the Building Science laboratory located at the basement level of the Sandford Fleming building, and in several repurposed office spaces located on the third floor of the Galbraith building. The combined estimated cost of development is $6.9-million ($4.9M for the CCCF and $2.0M for the BORL).

The project is pending funding, with a development proposal currently under review by the Canada Foundation for Innovation (CFI), and the University has identified sponsorship of the initiative as a key strategic priority within the Climate Positive Energy Initiative of its ambitious “Defy Gravity” fundraising campaign. We hope to receive favorable news that will allow us to advance the project in the very near future.

6.6 Future Space Planning

In the short-term, our focus within our facilities portfolio will be directed toward assessing potentials for the reallocation and/or intensification of our existing spaces, with a view to identifying opportunities for reassignment of existing underused spaces and/or relieving the Department of unusable space.

As stated earlier, many of the buildings on St. George campus are well-aged and in need of upgrade or some aspect of infrastructure renewal. In the case of the CivMin department, the majority of our assigned facilities are contained within buildings that are between 60 and 120 years old. Our greatest challenge in managing these facilities is in providing the financial resources necessary to respond to the escalating and compounded costs associated with basic repairs and remediation.

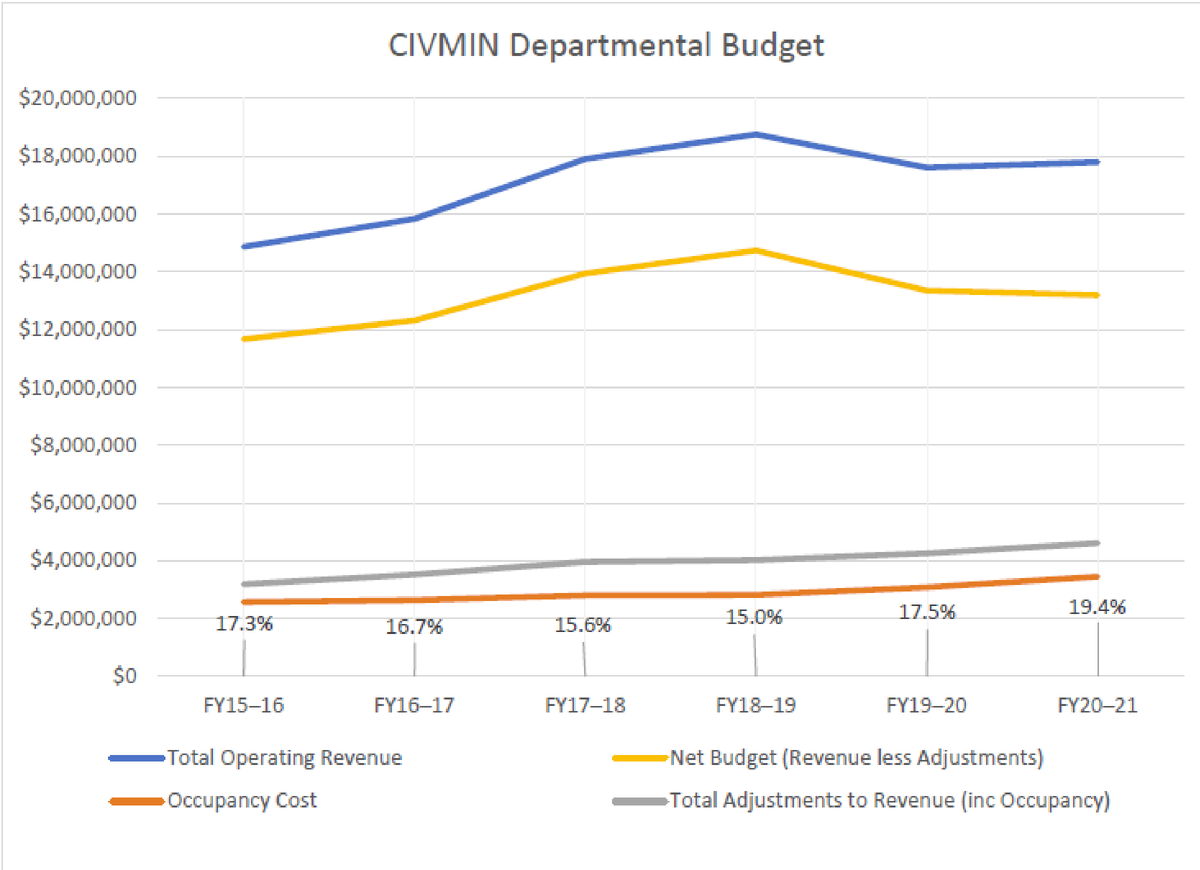
Additionally, the percentage of our operating budget that must be directed toward our base occupancy cost has been increasing year over year. Occupancy cost is determined by central administration on a flat dollar per NASM basis, regardless of building condition. The following shows the increase in the cost per NASM applied over the past six fiscal periods:

Table 6.1 Department of Civil and Mineral Engineering - Space Cost per NASM FY15-16 to FY20-21

FY15-16	FY16-17	FY17-18	FY18-19	FY19-20	FY20-21
$354.57	$362.87	$381.78	$384.44	$411.25	$445.56

While the Department has made modest acquisitions of additional space, occupancy cost escalations are primarily due to increases in central Facilities & Services costs [$/NASM] which incorporate factors for base building services such as electricity, heat, and water, which of course increases substantially in buildings that have not been updated to comply with present-day standards for operational efficiency. Combined with base budget decreases imposed over the past few fiscal years, occupancy costs as a percentage of our total attributed operational revenue has increased from 15% in FY17-18 to 19.4% in FY20-21, as shown in the figure below.

Figure 6.3 Department of Civil and Mineral Engineering - Occupancy Costs FY15-16 to FY20-21



All renovation and remedial upgrade costs are additionally charged back to occupying departments by central administration, including aspects of long-term deferred maintenance (such as asbestos remediation), which can represent a significant portion of the funds required to undertake a given renovation project. It is difficult to attract donations in support of infrastructure renewal or remediation, and operating budgets provide limited leeway to fund capital projects. As such the total project cost of a renovation or renewal project can become too prohibitive for a department to be able to proceed.

Our best recourse for managing our escalating facilities costs is to look for opportunities to intensify our space utilization, and to seek opportunities for relieving the Department of unusable space. For example, the departmental cost to maintain GB217 as a dedicated teaching facility has become notably significant when compared to the amount of time the classroom is being utilized by the Department for teaching. In a recent assessment undertaken by the SAC it was determined that the Department is accessing the room for 70 per cent of the time, and is booked by other departments during the remaining 30 per cent. There is no budgetary adjustment made for non-departmental use of this space, which in effect suggests that the Department is subsidizing these non-departmental activities.

Applying the latest occupancy fee ($445.46/NASM - 2021) the annual occupancy cost for this space works out to $44,590:

Table 6.2 Annual Occupancy Cost for Department Controlled Classrooms, FY2021

Room	NASM	Annual Cost
GB117	98.4	$ 43,833.26
GB217	100.1	$ 44,590.54
LMB500	68.2	$ 30,380.37
Sum	266.7	$ 188,804.17

Other University departments and institutes are certainly operating with far less classroom space, and indeed many of our own graduate and undergraduate classes take place in rooms operated directly by Learning Space Management (LSM). LSM is a University business unit (within UPDC) dedicated primarily to the operation of classroom spaces. It has established procedures and guidelines for room reservations and an established hourly fee schedule for use of University classrooms. Under the current LSM fee schedule, rooms with less than 80 occupants cost $10 per hour. For the GB217 CivMin usage, based on a factor of 1,512 hours per year (9 hours/day x 5 days/week x 4 weeks x 12 months x 70%) we would pay LSM $15,120 for access. However, as we are paying $44,590 in direct occupancy cost, this suggests that we are paying a premium of $29,470 to maintain control over this classroom. Therefore, there may be some opportunity to recoup and redirect some portion of our operating budget through this type of approach. Conversely, the Department could also consider retaining the space but repurposing it for other departmental uses as a means to addressing some of our other space allocation challenges.

Another example is the laboratory located in the basement of the Haultain building (HA53). Although this space is currently used as a resource for delivery of two of our undergraduate courses, the space itself is not entirely suitable for student use, primarily because it is not accessible, the ventilation in the building overall is not adequate, nor is it air conditioned which makes the environment extremely uncomfortable when fully occupied during warmer weather months. Were the Department to relinquish this space, we would realize a savings of roughly $49,000 per year ($445.46/NASM x 110 NASM). However, the challenge would be to identify an appropriately equipped alternate space in which to conduct the course labs. Both of the above are offered simply as examples to demonstrate one way in which the Department could generate some base funding to apply towards upgrading some of our other assigned facilities.

Over and above this, opportunity to bring further improvement to the Department's assigned space will be directed by our continued efforts in project-based fundraising, and through competition for funding that may be made available through infrastructure renewal initiatives. However, in the short term our ability to address our needs for augmented accommodation and/or facilities improvement will continue to be hampered by the limited space available for expansion on campus, as well as the implicit challenge of institutional-level deferred maintenance that can inextricably drive the cost of any single project beyond the Department's funding capabilities. We therefore hope that the University may eventually arrive at a solution that will provide some relief to help address these issues.

7. INTERNAL AND EXTERNAL RELATIONSHIPS

7.1 Internal Relationships

Within the University community members of the Civil and Mineral Engineering department regularly engage with other faculty, researchers and professional colleagues by virtue of the ongoing interactions that arise through administrative associations such as joint appointments and cross-community committee work, and in the many research based collaborative initiatives sponsored by the University and the Faculty. For example, XSeed is an interdivisional funding program designed to promote multi-disciplinary research, the IWISeed initiative similarly sponsors collaborative projects specific to water based research, the School of Cities supports multidisciplinary initiatives to address all aspects associated with urban development, planning and infrastructure, the Centre for Analytics and Artificial Intelligence Engineering (CARTE) supports machine learning and artificial intelligence research, and the Centre for Climate Science for Engineering. Our collective participation in these, and many other such initiatives, is fully documented throughout other sections of this Self-study report.

Internally, the Department sponsors a number of initiatives that serve to strengthen and enhance the sense of community among our constituency. Our weekly newsletter provides a vehicle for announcing the many special events that take place throughout the year, such as guest lectures and podcasts, student club events, and community gatherings. The newsletter also highlights the achievements of our students, the research undertaken by our faculty, and informs of other activities and announcements generated through the Faculty and the University community-at-large. The newsletter is widely distributed directly to all faculty, students, staff and vested alumni, and is reinforced on our website, which also provides access to archived materials. Announcements and highlights of the activities taking place within the Department are also featured on the various video display terminals positioned throughout our facilities. Our departmental events are always well attended by our students, staff and faculty, and we take pride in our ability to provide a welcoming and inclusive environment to all.

Further, the Department holds regular group meetings with our faculty on a monthly basis and department-wide meetings on a bi-monthly basis throughout the year to both inform and invite input into all aspects of departmental operations. Ironically, although some aspects of operations may have been stymied during the pandemic period, we found that through our necessitated dependence on Teams and other on-line resources to conduct meetings, attendance and involvement in departmental meetings increased significantly during this time. As a result, and in order to ensure sustained investment and equal access for all, we presently continue to hold some of these activities on-line.

Matters requiring formal approval are brought forward for consideration at our regular Departmental Council meetings. Although discussion and voting rights at Council are reserved for our appointed faculty members and students, with administrative directors attending as non-voting ex-officio members of Council, all members of our community are welcome to attend and observe the proceedings.

Students are continuously encouraged to bring any concerns that arise from their meetings within their respective student clubs forward for discussion at departmental meetings, which are presented by their club executive representatives.

7.2 External Relationships

There are several ways in which the Department maintains and strengthens its external relationships and connections to industry. Foremost among this are our two advisory boards, the Civil Engineering Industry Advisory Board, and the Lassonde Mineral Engineering Program Advisory Board. Both boards are extremely helpful in identifying opportunities for student engagement and expanding project-based experiential learning, and outlining potential new directions in research that are emerging from practice. The board membership lists below demonstrates the range of professional expertise we are fortunate to have available for consultation.

Table 7.1 Civil Engineering Industry and Lassonde Mineral Engineering Program Advisory Boards - Membership as at February, 2023

Civil Engineering Industry Advisory Board (IAB) Membership List - February 2023		
Board Member	**Professional Title**	**Company**
Anna Robak	Research Manager, Innovation and Future Ready	WSP Canada
Chris Andrews	Former Senior Vice President (retired)	Ellis Don
Chris Harhay	President	Harhay Developments
Eleanor McAteer	Director, Water Infrastructure Management	City of Toronto
Hugo Blasutta	Retired	Formerly CEO of WSP Canada
Maria Kelleher	Principal	Kelleher Environmental
Mike Buckley	Director Design Services	PCL Constructors Canada
Richard Cooper	Executive Vice President	Alterra
Scott Butler	Executive Director	Ontario Good Roads Association
Lassonde Mineral Engineering Program Advisory Board Membership List, February 2023		
Board Member	**Professional Title**	**Company**
Bahador Alast	Mining Engineer	Stantec
Channa Kumarage	Director, Corporate Development	Minto Metals Corp
Donovan Pollitt	President	Pollitt Mining
Natasha Vaz	EVP, Chief Operating Officer, Ontario, Australia & Mexico	Agnico Eagle
Sabrina Miguel	Senior Mine Planner	Kinross Gold Corporation
Sarah Heffernan	Mining Lead - Data Team	BDO Lixar

The Research section of this report, the summary list of faculty research affiliations provided in Appendix D, the list of awards and distinctions accorded to our faculty members provided in Appendix C.6, the summary of administrative duties assumed by our faculty provided in Appendix C.3, and the list of sessional instructors provided in Appendix C.1, all serve to demonstrate the breadth of our external relationships. Through our collective collaborations in research, our affiliations with cognate departments both within the Faculty and with other units at the University through service, our relationships with industry through advisory boards and industry-sponsored student engagement, and our ongoing outreach and connection with alumni, we are assured that our relationship with each of these important stakeholders encourages their ongoing participation and proactive involvement with the Department.

Moving forward, and in consideration of the recent mandate issued by the Faculty to increase enrollments in our MEng and MEngCEM programs, we recognize that we will need to extend our outreach and broaden our base of external relationships in order to generate more opportunities for course-based projects and internship work placements. As such, growing and maintaining excellent relations with alumni and industry partners will remain a high priority for the Department throughout the coming years.

8. FUTURE DIRECTIONS

In 2018 a large element of our plan for future directions was tied to the renaming of the department to "Department of Civil & Mineral Engineering", which was viewed as an opportunity to embark on a rebranding process that would serve to rejuvenate and revitalize the CivMin community in many ways. For example, strengthening connections among undergraduate students, solidifying ties with a greater number of alumni, and building on our existing relationships with industry. We now see that this has most certainly led to improved recognition of our Mineral Engineering program overall, that our faculty have adjusted and are consistent in noting the proper departmental name in their journal articles, and that there is a growing sense of inclusion in the Department among our Mineral Engineering student population.

Moving forward, our focus will be placed in upholding our commitment to curriculum review of both our undergraduate and graduate program offerings and to ensuring that our ongoing work in this area continues to progress, embracing innovations in teaching and experiential learning to sustain and elevate our undergraduate and graduate programs, increasing opportunities to expose our undergraduate students to data science elements (initially via elective courses), developing initiatives to enhance our outreach and ensure success in our recruitment of top graduate students (both doctoral and professional streams), continuing to identify areas for optimization of administrative systems within the Department (thereby providing improved support for our education and research missions) and continuing to build and strengthen our external relations with alumni and industry to increase opportunities that will enrich the student experience and raise our research impact through academic-industry partnerships.

More specifically, through our ongoing discussions and subsequent formulation of our Strategic Plan we have identified the following key objectives to guide our future direction within each of our operational portfolios, as follows:

8.1 Undergraduate Education

- Review undergraduate curriculum (content, labs, delivery, assessment) and develop a meaningful, interactive visualization of the curriculum to inform and facilitate student elective course selection
- Provide additional opportunities for experiential learning
- Increase equity, diversity, and inclusion in the make-up of the student body and in course delivery
- Increase transfers from TrackOne to Civil & Mineral engineering through increased exposure to CivMin faculty members
- Further the development of a distinctive program option in Engineering Science
- Provide opportunities for global engagement through internships, exchange programs and volunteer service through participation in FASE's initiative for global engagement
- Increase exposure of undergraduate students to relevant research
- Continuously source for and identify emerging trends and needs in the civil and mineral engineering profession

8.2 Graduate Education – Research Stream (MASc and PhD)

- Review graduate curriculum across the department, with emphasis on content and coherency of course offerings in thematic research areas
- Increase doctoral stream enrolment
- Increase graduate student funding to better align with the rising cost of living in Toronto, and streamlining the tracking of tranche payments throughout the year to ensure that all student funding commitments are met within the appropriate timelines
- Update the presentation of the various departmental research themes to improve clarity and coherence for internal and external audiences
- Promote professional development opportunities, research-based internships (such as those supported through Mitacs and sponsoring host companies), and international exchange opportunities for graduate students
- Increase the promotion and highlighting of the achievements of our current graduate students and recently graduated alumni
- Improve resources and support for onboarding graduate students with respect to relevant academic policies and procedures
- Optimize use of and improve the quality of graduate student office space

8.3 Graduate Education – Professional Stream (MEng and MEngCEM)

- Expand current course offerings and improve alignment with the objectives of the MEng program, including a focus on coherency of program emphases (specializations)
- Increase mentorship associations and improve access to departmental resources for MEng students
- Review and enhance the content and structure of the MEngCEM program
- Increase the number of MEng students participating in both design and research-based projects
- Improve branding and promotion of our MEng programs
- Advance the creation of a new online MEng program in Mineral Engineering
- Review admissions criteria with a view to reassessing the role of career experience in admission decisions
- Investigate resources to enable online educational opportunities
- Incorporate developments in new technologies and artificial intelligence into course offerings

8.4 Undergraduate and Graduate Student Experience

- Improve guidance and access to resources in support of student wellness
- Continue to foster our strong sense of community

- Increase our resource base for mentoring of students
- Enhance support of student clubs through improving club facilities and increasing financial and/or administrative support to the extent possible
- Promote and encourage opportunities for international experience and international exchanges
- Ensure that students are well prepared for their future careers through program enhancements, ongoing interactions with industry partners, alumni career panel discussions, and department sponsored career fairs

8.5 Departmental Research

- Maximize success of junior faculty through mentorships and support for grant writing
- Assist faculty in accessing funding from the University's "Major Research Project Management" program to support administration of large Tri-Council funded projects in excess of $1-million.
- Encourage pursuit of grand challenges
- Promote novel partnerships
- Review, and where necessary, revise guidelines to ensure optimal and equitable use of departmental resources
- Increase industry support of research, both for funding research and for student training
- Increase service contract work to support our research activities and research facilities
- Increase philanthropy in support of resources (both physical and human) for research
- Implement an improved system for tracking safety training and ensuring best practices for safety in operation of all research activity
- Explore opportunities for new directions in research, and proactively encourage faculty to become involved in large-scale collaborative initiatives, such as the Centre for Analytics and AI Engineering (CARTE)

8.6 Departmental Community

- Continue to foster and build upon our mutual sense of community, collegiality and pride in association with the Department
- Continue to encourage our high level of participation in departmental social and other events from students, staff, faculty
- Continue to encourage our high level of volunteerism
- Provide ongoing support to all members of the CivMin community in achieving their potential through supporting career progression and professional development, celebrating our achievements, and encouraging development of new department-wide initiatives

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GLOSSARY

Acronyms or terms used throughout this document:

AI	Artificial Intelligence
AMS	(University of Toronto) Administrative Management System
APSC	Faculty of Applied Science & Engineering
APSXXX	Specialized, non-technical Engineering course
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
AWWA	American Water Works Association
BME	(FASE) Institute of Biomedical Engineering
BORL	Buildig-Occupant Response Laboratory
BSSO	Building Science Specialist of Ontario
CAMP	Civil and Mineral Practicals (course); Survey CAMP
CARTE	(FASE) Centre for Analytics and AI Engineering
CATTS	(FASE) Centre for Automated and Transformative Transportation Systems
CCCF	Contained Climate Chamber Facility
CEAB	Canadian Engineering Accreditation Board
CECCS	(University of Toronto) Committee on the Environment, Climate Change and Sustainability
CEMXXX	Cities Engineering and Management (program/course)
CGEN	(FASE) Centre for Global Engineering
CHE/ChemE	Department of Chemical Engineering and Applied Chemistry
CivMin	Department of Civil & Mineral Engineering
CIVXXX	Civil Engineering undergraduate or graduate course
CLTA	Contractually Limited Term Appointment
CLUE	City Logistics for the Urban Economy (research initiative)
CMEXXX	Civil and Mineral Engineering undergraduate course
COU	Council of Ontario Universities
CPB	Cemented paste backfill
CRC	Canada Research Chair (NSERC)
CSE	(FASE) Centre for Climate Science and Engineering
CS/HSS	Complementary Studies/Humanities and Social Sciences (elective courses)
CSUR	Canadian Society for Unconventional Resources
CTBUH	Council on Tall Buildings and Urban Habitat
DEEP	Da Vinci Engineering Enrichment Program (Summer Academy)
Division III	University of Toronto/School of Graduate Studies term to denote departments offering programs in the area of Physical Sciences
DMG	(UTTRI) Data Management Group
DSI	(University of Toronto) Data Sciences Institute
ECE	The Edward S. Rogers Snr. Department of Electrical and Computer Engineering
ECG	Electrocardiogram
EH&S	(University of Toronto) Environmental Health & Safety (office/training courses)
ELITE	Entrepreneurship, Leadership, Innovation and Technology in Engineering (certificate program)
EMHSeed	(University of Toronto) interdivisional research funding program designed to promote multi-disciplinary research…between a co-PI from FASE and a co-PI from outside of Engineering (in particular the Faculty of Medicine and other health science areas)
EngSci	Division of Engineering Science
ExSeed	(University of Toronto) interdivisional research funding program designed to promote multi-disciplinary research…between a co-PI from FASE and a co-PI from outside of Engineering
FASE	Faculty of Applied Science & Engineering
FCE	Full-Course Equivalent

FDEM	Frequency Domaine Electromagnetics/Finite-discrete element method
FTE	Full-time Equivalent (course credit)
GB	Galbraith Building, St. George Campus
GDLE	Graduate Degree Level Expectation
GHG	Greenhouse gas
GPA	Grade Point Average
GTHA	Greater Toronto and Hamilton Area
HA	Haultain Building, St. George Campus
HCAT	Heavy Construction Association of Ontario
ILEAD	(University of Toronto) Troost Institute for Leadership Education in Engineering
ILUTE	Integrated Land Use, Transportation, Environment (modelling system)
ISIAQ	International Society of Indoor Air Quality and Climate
ISTEP	(FASE) Institute for Studies in Transdisciplinary Engineering Education and Practice
IT	Information Technology
ITS	Intelligent Transportation System
IWI	(FASE) Institute for Water Innovation
IWISeed	(FASE) Institute for Water Innovation research program designed to promote inter-disciplinary research in water treatment and technologies
JDEXXX	Graduate course code for courses common to all FASE departments
LLC	(University of Toronto) Centre for Leaning, Leadership and Culture
LME	Lassonde Mineral Engineering program
LSM	Learning Space Management office
MAC	Mining Association of Canada
MB/LMB	Lassonde Mining Building, St. George Campus
MEND	Mine Enviroment Neutral Drainage program
MIE	Department of Mechanical & Industrial Engineering
MINXXX	Mineral Engineering course
MRI	Magnetic Resonance Imaging
MSE	Department of Materials Science & Engineering
NASEM	National Academies of Science, Engineering and Medicine
NASM	Net Assignable Square Meters
NSERC	Natural Sciences and Engineering Research Council of Canada
NSSE	National Survey of Student Engagement
OBEC	Ontario Building Envelop Council
OECD	Organisation for Economic Co-operation and Development
OMA	Ontario Mining Association
ORF-RE	Ontario Research Fund - Research Excellence program
PEY	Professional Experience Year (undergraduate co-op) program
PFAS	Perfluoroalkyl and Polyfluoralkyl substances; often commonly referred to as “forever chemicals”.
PTR	Progression through the Ranks (University of Toronto academic promotion process)
RILEM	International Union of Laboratories and Experts in Construction Materials, Systems and Structures
SAC	(Department of) Civil & Mineral Engineering) Space Advisory Committee
SF	Sandford Fleming Building, St. George Campus
SHM	Structural Health Monitoring
Skule™	University of Toronto Engineering Society
TA/TAship	Teaching Assistant/Assistantship
TEAMS	MicroSoft Office collaboration platform
TMG	(UTTRI) Travel Modelling Group
TMU	Toronto Metropolitan University
TrackOne	General first year of undergraduate studies in FASE. Upon successful completion of TrackOne students choose from one of the Engineering undergraduate programs, excluding Engineering Science
TRAQ	Transportation and Air Quality (research group)
TRB	Transportation Research Board
Tri-Council	Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council (NSERC) and the Social Sciences and Humanities Research Coumcil (SSHRC)
U of T	University of Toronto

U15	U15 Group of Canadian Research Universities
UDLE	Undergraduate Degree Level Expectation
UK	United Kingdom
UPDC	University Planning, Design and Construction Office
USC	(Civil & Mineral Engineering) Undergraduate Studies Committee
USRA	NSERC Undergraduate Student Research Awards
UTEA	University of Toronto Excellence Awards (for undergraduate summer research projects)
UTIAS	University of Toronto Institute for Aerospace Studies
UTM	University of Toronto Mississauga
UTQAP	University of Toronto Quality Assurance Program
UTSC	University of Toronto Scarborough
UTTRI	University of Toronto Transportation Research Institute
VCD	Viscoelastic Coupling Damper
WGU	Weighted Graduate Unit

Degree Codes

AECIVBASC	Bachelor of Applied Science - Civil Engineering
AELMEBASC	Bachelor of Applied Science - Lassonde Mineral Engineerning
CI PHD F	Doctor of Philosophy in Civil Engineering - Flexible-time Option
MASc	Master of Applied Science in Civil Engineering
MEng	Master of Engineering in Civil Engineering
MEngCEM	Master of Engineering in Cities Engineering and Management
MEng ETF	Master of Engineering - Extended Full-time Option
PhD	Doctor of Philosophy in Civil Engineering

APPENDICES

APPENDICES

Appendix: A1 Comparison of U of T Engineering with Ontario and Canada, 2018-19 166

Appendix: A2 Comparison of U of T Engineering with Ontario and Canada 2019–2020 167

Appendix: A.3 Comparison of U of T Engineering with the University of Toronto, 2019–2020 168

Appendix: A.4 Comparison of U of T Engineering with the University of Toronto, 2020–2021 169

Appendix: A.5 Department of Civil & Mineral Engineering Self-Study 2022 Survey Results Undergraduate - Civil Engineering 170

Direct Student Commentary 173

Direct Student Commentary 190

Appendix: A.6 Department of Civil & Mineral Engineering Self-Study 2022 Survey Results Undergraduate- Mineral Engineering 193

Direct Student Commentary 204

Appendix: A.7 Department of Civil & Mineral Engineering Self-Study 2022 Survey Results Graduate - Doctoral-Stream Programs 206

Direct Student Commentary 216

Direct Student Commentary 217

Appendix: A.8 Department of Civil & Mineral Engineering Self-Study 2022 Survey Results Graduate - Professional Programs 234

Direct Student Commentary 240

Appendix: A.9 Department of Civil & Mineral Engineering Self-Study 2022 Survey Results - Administrative and Technical Staff 242

Appendix: A.10 2018-19 Final Assessment Report and Implementation Plan: Civil and Mineral Engineering 249

Appendix: B.1 Civil Engineering Program Curriculum, 2022-23 259

Appendix: B.2 Lassonde Mineral Engineering Program Curriculum, 2022-23 264

Appendix: B.3 Canadian Engineering Accreditation Board Graduate Attributes 267

Appendix: B.4 National Survey of Student Engagement (NSSE) Results for Department of Civil Engineering (2022 Survey) 268

Appendix: B.5 Program of Industry Participants in CivMin Career Fair, January 2023 272

Appendix: B.6 Summary of Discussion from Student Services Staff Retreat, 2018 280

Appendix: B.7 Civil & Mineral Engineering Funding Packages 2022-23 287

Appendix: B.8 School of Graduate Studies Academic Calendar - Civil Engineering 2022-23 290

Appendix: B.9 Degree Level Expectations for Graduates Receiving the Degree of Master of Engineering 308

Appendix: B.10 Degree Level Expectations for Graduates Receiving the Degree of Master of Applied Science 310

Appendix: B.11 Degree Level Expectations for Graduates Receiving the Doctor of Philosophy 312

Appendix: C.1 Courses Taught by Sessional Instructors, 2022-2023 314

Appendix: C.2 Workload Policy and Procedures for Faculty in Civil & Mineral Engineering 316

Appendix: C.3 Administrative Positions held by Civil & Mineral Engineering Faculty as of December, 2022 322

Appendix: C.4 Guidelines for Mentoring Junior Faculty 325

Appendix: C.5 FASE Best Practices for Assessing Teaching Effectiveness in PTR Decisions 327

Appendix: C.6 Awards and Distinctions Conferred on U of T Civil and Mineral Engineering Faculty, 2006 to Presents 329

Appendix: C.7 Awards and Distinctions Conferred on Emeritus and Retired Faculty, 2005 to Present 331

Appendix: D Department of Civil and Mineral Engineering - Faculty Research Areas 2022-23 (listed by Research Theme) 332

Appendix: E Department of Civil and Mineral Engineering Constitution 340

Appendix: F Policy on Management of Departmental Space 347

Provostial Supplemental Documentation 352

Graduate Education – Research Stream (MASc and PhD) 352
University of Toronto Student Services Statement (St. George Campus) 355

FASE Supplemental Documentation

Faculty of Applied Science & Engineering: By the Numbers 2022

Additional Resources

Department of Civil & Mineral Engineering Strategic Plan 2023-28
Civil & Mineral Engineering Self-Study 2017

Appendix: A1 Comparison of U of T Engineering with Ontario and Canada, 2018-19

U of T Engineering		Ontario	U of T % of Ontario	Canada	U of T % of Canada
Undergraduate					
Enrolment (FTE)	5,273	36,732	14.4%	88,278	6.0%
% Women	34.4%	23.8%		21.9%	
Degrees Awarded	1,057	7,648	13.8%	16,725	6.3%
% Women	27.5%	20.6%		21.0%	
Master's (MEng, MASc and MHSc)					
Enrolment (FTE)	1,296	7,624	17.0%	17,450	7.4%
Degrees Awarded	751	3,796	19.8%	7,768	9.7%
% Women	27.2%	24.6%		25.2%	
Doctoral (PhD)					
Enrolment (FTE)	849	3,676	23.1%	9,653	8.8%
Degrees Awarded	143	583	24.5%	1,576	9.1%
% Women	33.6%	25.0%		24.9%	
Faculty					
Tenured and Tenure-Stream	237	1,635	14.5%	3,798	6.2%
% Women	20.3%	17.7%		15.9%	
Major Awards					
Major Awards Received	10	29	34.5%	61	16.4%
Research Funding					
NSERC Funding for Engineering	$35.4M	$156.6M	22.6%	$378.8M	9.4%

Note: Enrolment and degrees awarded are based on the 2018 calendar year. Faculty data is as of November 2018 and include tenured and tenure-stream faculty only. NSERC research funding is based on the 2018–2019 grant year (April-March). Major award counts are based on the 2019 calendar year.Appendix: A2

Appendix: A2 Comparison of U of T Engineering with Ontario and Canada 2019–2020

U of T Engineering		Ontario	U of T % of Ontario	Canada	U of T % of Canada
Undergraduate					
Enrolment (FTE)	5,257	40,162	13.1%	88,273	6.0%
% Women	36.7%	24.6%		23.4%	
Degrees Awarded	1,096	7,056	15.5%	18,154	6.0%
% Women	27.5%	22.1%		22.1%	
Master's (MEng, MASc and MHSc)					
Enrolment (FTE)	1,325	7,723	17.2%	18,533	7.1%
Degrees Awarded	763	4,731	16.1%	8,897	8.6%
% Women	29.2%	25.3%		25.7%	
Doctoral (PhD)					
Enrolment (FTE)	934	3,927	23.8%	10,706	8.7%
Degrees Awarded	164	693	23.7%	1,685	9.7%
% Women	26.2%	24.2%		23.4%	
Faculty					
Tenured and Tenure-Stream	240	1,713	14.0%	3,982	6.0%
% Women	19.7%	16.0%		15.9%	
Major Awards					
Major Awards Received	16	38	42.1%	64	25.0%
Research Funding					
NSERC Funding for Engineering	$34.3M	$160.0M	21.4%	$391.3M	8.8%

Note: Because of the lag in reporting from some peer institutions, 2019–2020 is the most recent year for which all comparison data is available. Enrolment and degrees awarded are based on the 2019 calendar year. Faculty data is current as of November 2019. NSERC research funding is based on the 2019–2020 grant year (April-March). Major award counts are based on the 2020 calendar year.

Appendix: A.3 Comparison of U of T Engineering with the University of Toronto, 2019–2020

U of T Engineering		St. George Campus	Engineering % of Campus		University of Toronto	Engineering % of U of T
Student Enrolment						
Undergraduate	5,280	38,526	13.7%		67,252	7.9%
Professional Master's (MEng and MHSc)	991	9,159	10.8%		9,845	10.1%
Research Master's (MASc)	635	2,982	21.3%		3,111	20.4%
Doctoral (PhD)	1,010	6,560	15.4%		6,966	14.5%
All Students	7,916	57,227	13.8%		87,174	9.1%
Degrees Awarded						
Undergraduate	1,080	8,323	13.0%		13,291	8.1%
Professional Master's (MEng and MHSc)	497	4,326	11.5%		4,724	10.5%
Research Master's (MASc)	295	1,453	20.3%		1,522	19.4%
Doctoral (PhD)	133	810	16.4%		845	15.7%
Total Degrees	2,005	14,912	13.4%		20,382	9.8%
Faculty and Staff						
Professoriate	266				3,163	8.4%
Administrative and Technical Staff	361				7,563	4.8%
Research Funding						
Sponsored Research Funding	$100.4M				$502.9M	20.0%
Industry Research Funding	$16.4M				$29.1M	56.4%
Space						
Space (NASMs)	70,638	640,881	11.0%		852,933	8.3%
Revenue						
University-wide Costs	$75.8M				$605.6M	12.5%
Total Operating Revenue	$215.9M				$2,336.4M	9.2%

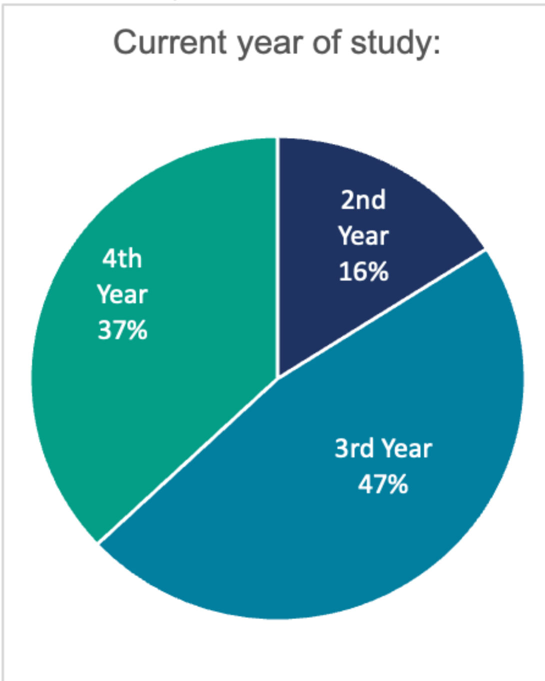
Appendix: A.4 Comparison of U of T Engineering with the University of Toronto, 2020–2021

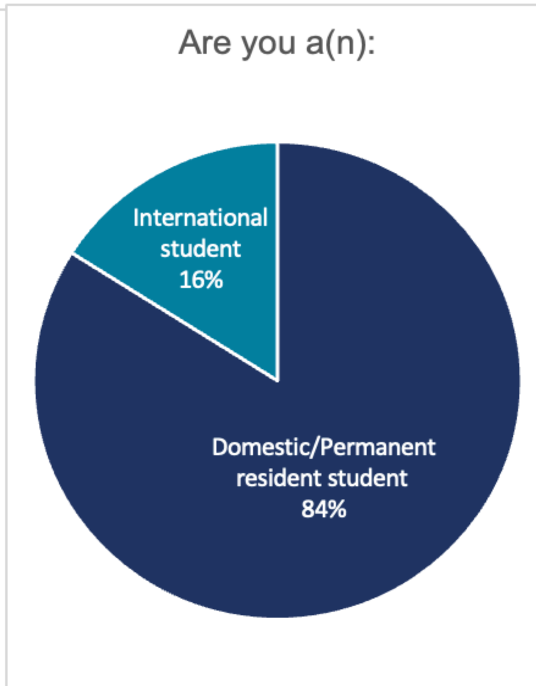
U of T Engineering		St. George Campus	Engineering % of Campus		University of Toronto	Engineering % of U of T
Student Enrolment						
Undergraduate	5,538	40,002	13.8%		69,401	8.0%
Professional Master's (MEng and MHSc)	997	9,200	10.8%		9,876	10.1%
Research Master's (MASc)	653	2,933	22.3%		3,049	21.4%
Doctoral (PhD)	1,081	7,000	15.4%		7,423	14.6%
All Students	8,269	59,135	14.0%		89,749	9.2%
Degrees Awarded						
Undergraduate	1,011	8,594	11.8%		14,138	7.2%
Professional Master's (MEng and MHSc)	552	4,229	13.1%		4,675	11.8%
Research Master's (MASc)	243	1,278	19.0%		1,326	18.3%
Doctoral (PhD)	119	766	15.5%		824	14.4%
Total Degrees	1,925	14,867	12.9%		20,963	9.2%
Faculty and Staff						
Professoriate	272				3,187	8.5%
Administrative and Technical Staff	366				8,746	4.2%
Research Funding						
Sponsored Research Funding	$96.0M				$496.6M	19.3%
Industry Research Funding	$20.1M				$39.2M	51.4%
Space						
Space (NASMs)	71,740	643,642	11.1%		861,012	8.3%
Revenue						
University-wide Costs	$82.3M				$645.1M	12.8%
Total Operating Revenue	$208.1M				$2,185.8M	9.5%

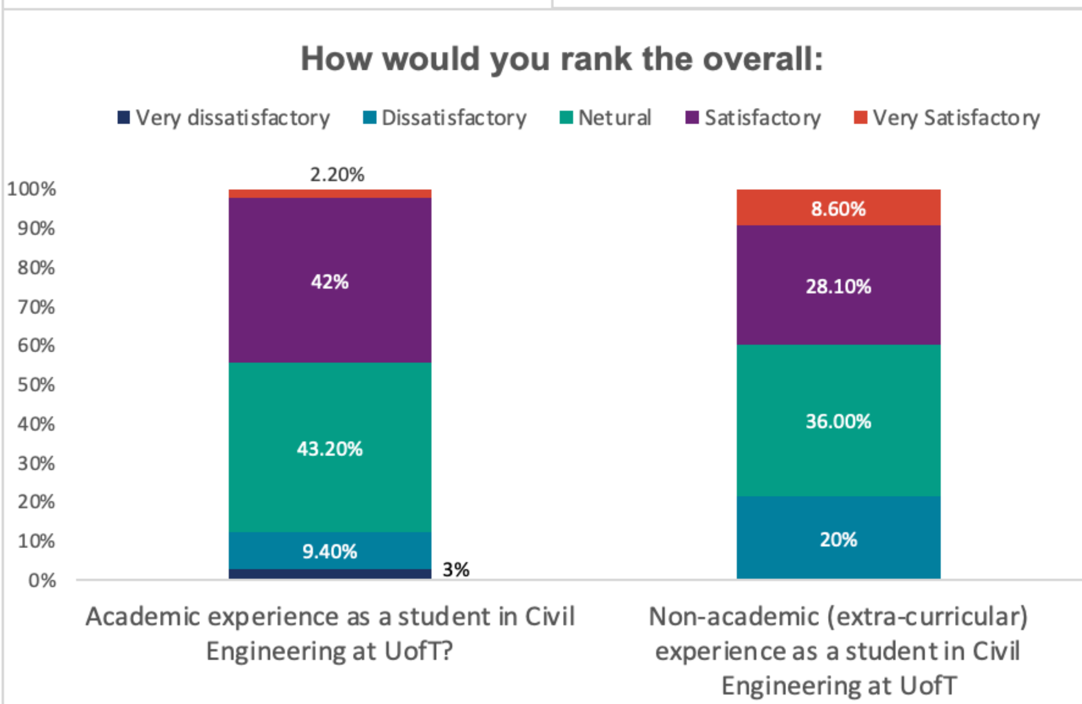
Appendix: A.5 Department of Civil & Mineral Engineering Self-Study 2022 Survey Results Undergraduate - Civil Engineering

DEPARTMENT OF CIVIL & MINERAL ENGINEERING SELF STUDY 2022-23 - UNDERGRADUATE STUDENT SURVEY

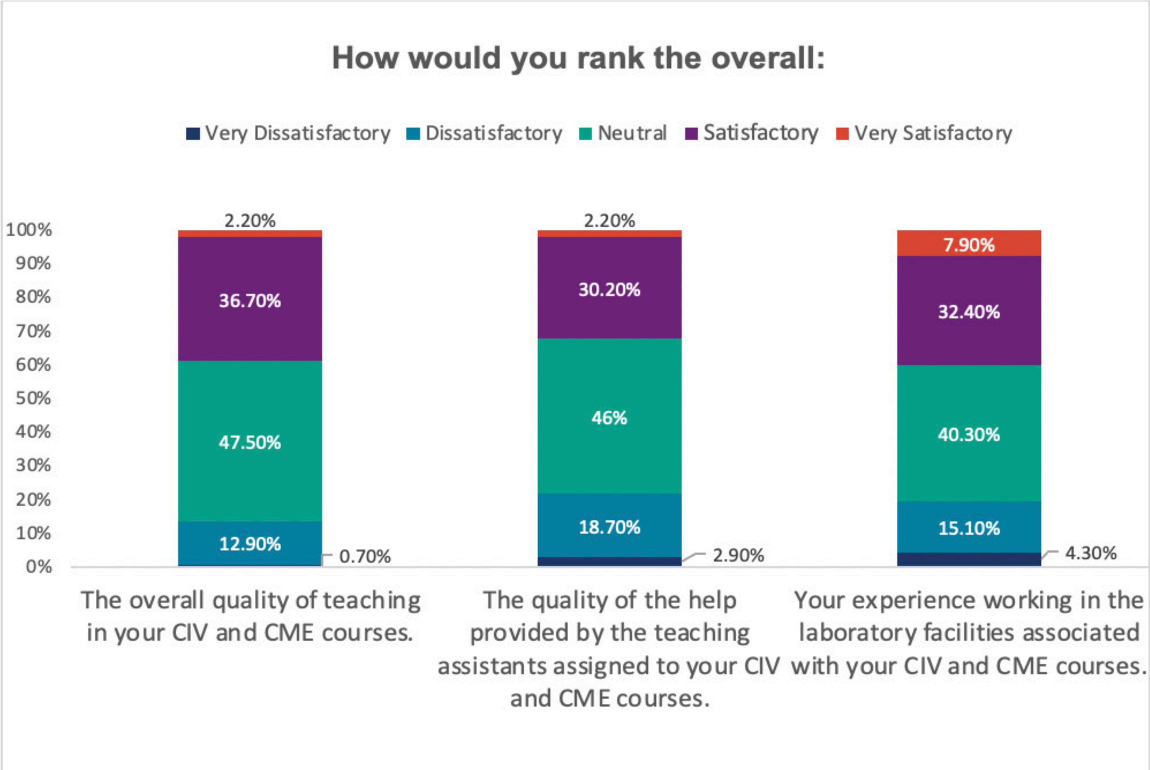
ABOUT YOU:



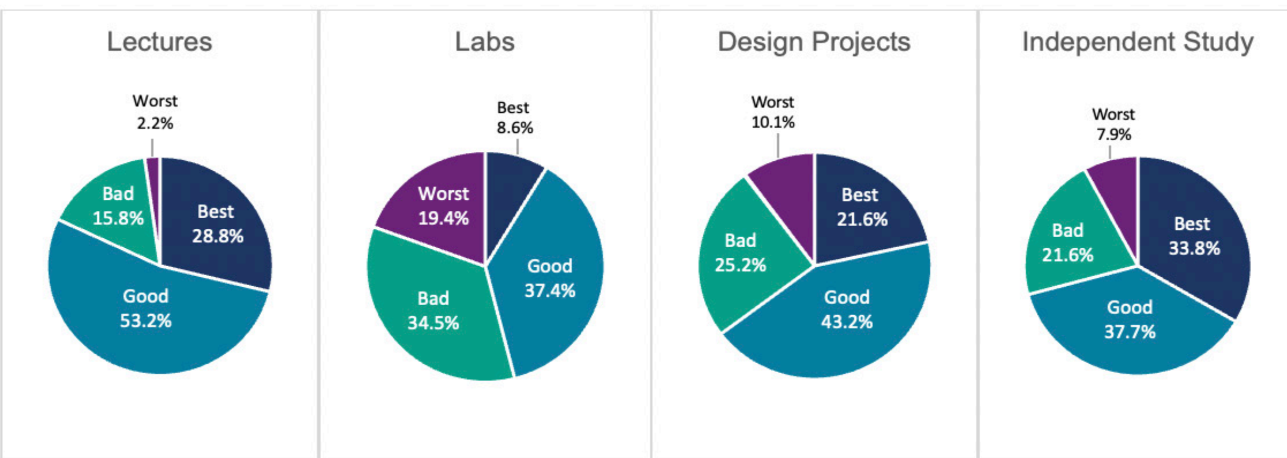


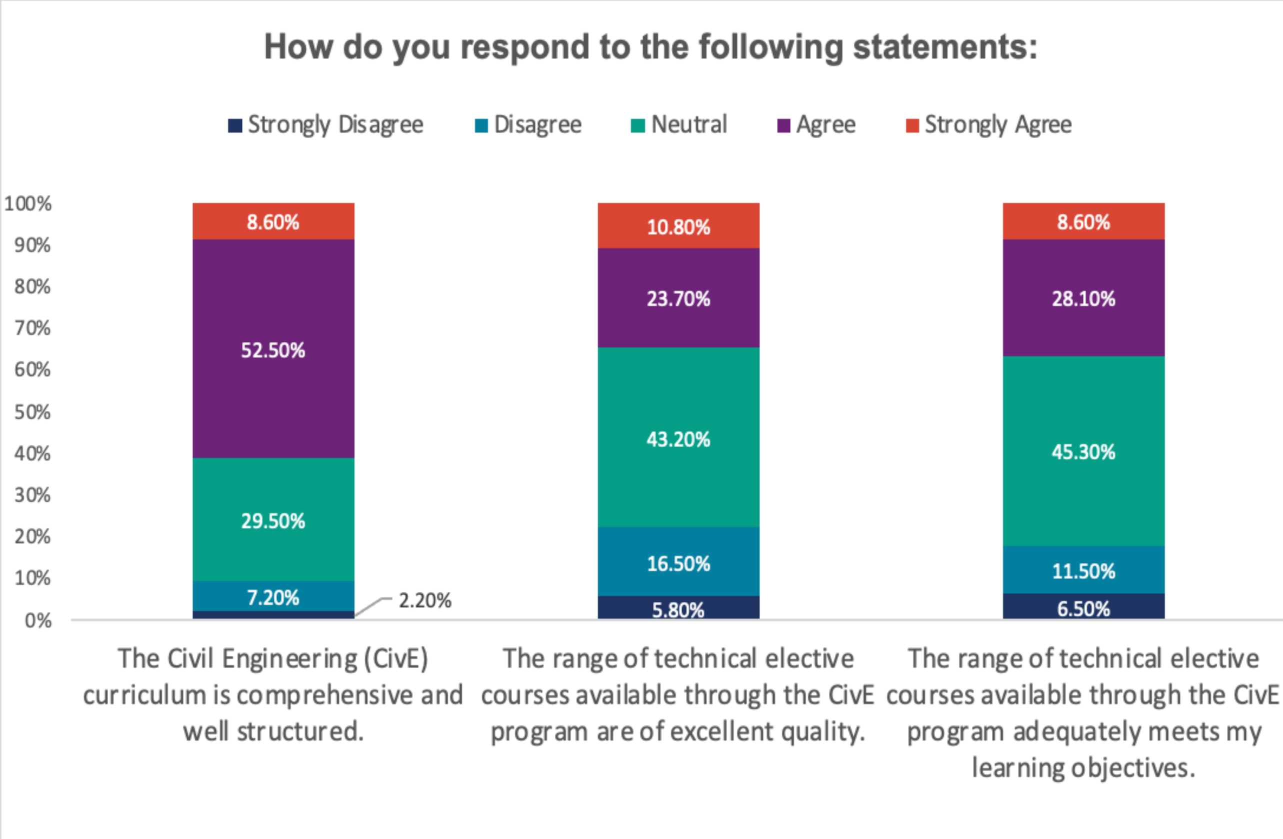


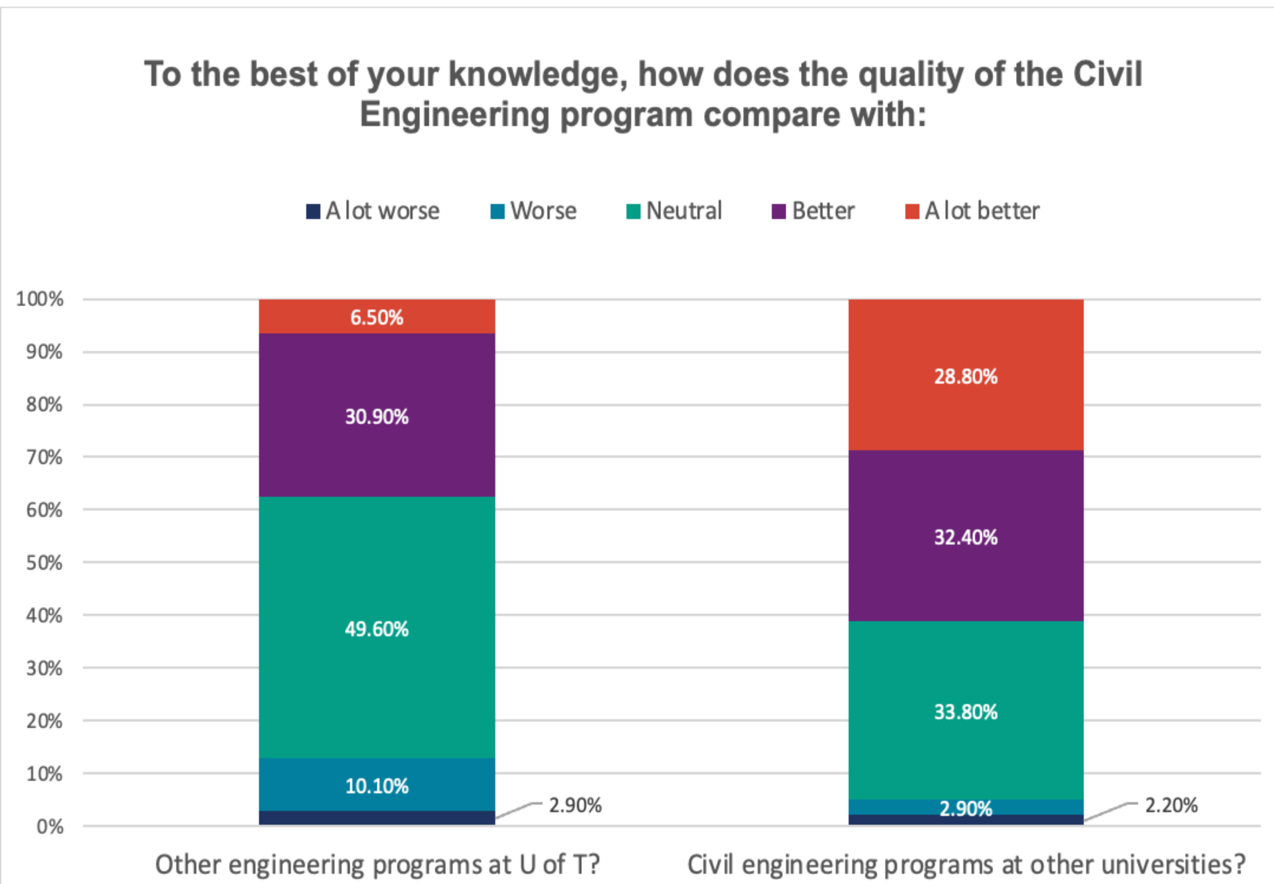
ACADEMIC EXPERIENCE:



In your experience, what types of academic activity have provided the **worst and best** formats for learning in your CIV and CME courses?




How do you respond to the following statements:
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
8.60%
52.50%
29.50%
7.20%
2.20%
10.80%
23.70%
43.20%
16.50%
5.80%
8.60%
28.10%
45.30%
11.50%
6.50%
The Civil Engineering (CivE) curriculum is comprehensive and well structured.
The range of technical elective courses available through the CivE program are of excellent quality.
The range of technical elective courses available through the CivE program adequately meets my learning objectives.


To the best of your knowledge, how does the quality of the Civil Engineering program compare with:
A lot worse
Worse
Neutral
Better
A lot better
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
6.50%
30.90%
49.60%
10.10%
2.90%
28.80%
32.40%
33.80%
2.90%
2.20%
Other engineering programs at U of T?
Civil engineering programs at other universities?

DIRECT STUDENT COMMENTARY

Is there any further comment you would like to make regarding your overall academic experience?

- Professors are lacking in teaching skills.
- I find TAs to not be good quality; they usually do not know course content. Professors are also about 50/50 hit or miss, with some being brilliant and some are poor.
- More experienced professors to teach especially in higher-year courses.
- More consistency in proficiency of teaching - those who do research well don't necessarily teach well.
- Temporary profs should have training, much like the formal professors do. Have struggled with profs that fill in for profs on sabbatical, and then it leaves worse foundations for further courses. For example, currently, with CIV313.
- Sometimes workloads are too heavy to facilitate deeper learning in specific fields.
- No life.
- Overall, U of T has been a great academic experience, however, the lack to technical electives in fields other than structural does make it hard to learn more about topics I am interested in (transportation) and therefore requires me to find a way to get into a master's program so I can learn more.
- Some professors do not have the qualifications to be teaching - lack of skills. There are a lot of other universities that have better academic experience than U of T.
- The professors, and especially the sessional instructors, are very hit and miss. Especially when the course is run online.
- I love U of T and the Civ program but I, and a lot of others I know, have found the variance in teaching quality to be a bit frustrating. There are so many great profs in the program, and it's just a bit disappointing to have had almost a semester's worth of courses taught by PhD candidates or profs who really just don't seem up to the standard that U of T sets for itself and advertises. I realize this may be a special case, as I have no doubt coming out of COVID has been a contributor to this. But, again, it's just a bit disappointing.
- Some professors were amazing, but some professors make learning harder than it should've been. The learning experience varies with each course, but the majority of classes this semester are particularly hard to sit through.
- I feel like we are just told information and are expected to know how to answer hard questions for assignments without adequate help. Why don't we do questions together as a class during tutorial that are actually of similar difficulty to assignments so that we have help. This is what is done for Geotechnical Engineering 2 and it is very helpful. For some courses we do quizzes during tutorials and we don't get a chance to learn. Some other classes we are told to work together and figure it out, but people end up working independently. It's best when the TA is guiding all of us through questions.
- I recommend that surveys / instructor reviews be done throughout semester and not at the end. Will get more meaningful / accurate feedbacks.
- Technical electives in fourth year have really, really underqualified TAs.

- Too many courses focused on structural – it feels like the university just reads memes that civil engineers are bridge builders. Some of the courses in second year should be taken out so that we can be introduced to streams such as building science, transportation and geotech in second year. Then third year should have no mandatory courses and be structured like fourth year with students allowed to decide what they wish to specialize in. Also needs to be a much greater variety of tech electives. It's crazy that I only have two tech electives applying to what I wish to do with my career. In fact, I've only had four courses applying to my career in four years, while I've taken six structural courses with another four structural tech electives available. Capstone should also be a full-year course, while adding somewhat greater expectations on the individual deliverables, but not on the amount of deliverables. Currently, there is about a deliverable every two weeks, and two presentations, which isn't enough time to do when taking other classes. Early deliverables are 20 pages with final ones at 40 and 100 pages. At the time of writing this, we are now one week behind schedule on deliverables as the whole class has needed extensions and we are still on 20-page deliverables. As things get pushed back more and more, I struggle to see how there won't be a significant hit in quality to complete the final report in time. It also seems to be acknowledged by our instructor, who continues to ask less and less of our project, as he recognizes we have little time to complete what was initially envisioned.

- Quality of teaching is usually good; however, it varies SIGNIFICANTLY by professor. I have had many great profs, but also a few bad profs.

- I think that all my ratings are subjective and vary from student to student. However, I believe there are not enough choices for technical courses. For example, U of T provides a good amount of structure, Geotech/rock and transportation courses but lack in the other department. I was interested in construction engineering and water/wastewater treatment but with very minimum options. Lectures really depends on the individual professor. Some professors expect you to learn on your own. I like a professor who pretty much holds my hand and goes through many examples, which helps me learn better. I also feel like the fourth-year course load is heavy which actually put me into a depressed state during my third year, and I had to drop a whole semester because I was overwhelmed with the workload. After that, I decided to go part time. I do not feel a school should make students feel this way. You can ask any student at U of T Engineering and they will tell you that U of T Engineering is a depressing environment to be in. As a U of T Engineering student, you are expected to basically be at school roughly 9 a.m.-6 p.m. with multiple assignments to hand in each week, while keeping up with the lectures. As a commuter, when I was full time, I had to wake up at 7 a.m. and get home at 7:30 p.m. I am unable to do well in school without having to sacrifice my extracurricular activities, social life, and sleep. It's just not healthy.

- It is overall disappointing to be paying this amount for a tuition domestically and having "professors" who are PhD students a few years after they've received their PhD. Eng Math 1 & 2 were worrying examples of this and now CIV313 - Reinforced concrete further reinforces the notion that the University is apathetic about the quality of education given out to its students. These lecturers are very often unaware of the class's understanding of a topic and don't bother improving their teaching style to help the students. CIV313, CIV324, and CME263 were/are unfortunate examples of this, where the lecturer simply prepares notes to bring to class to then either read aloud in a PowerPoint presentation or just copied onto the board with minimal explanation. In other cases, such as CME321 and CIV332, where the professors are renowned experts in their field and are nice people there arises another problem. Their great accomplishments and experiences simply do not transfer over to a professorial position where they can effectively convey concepts to the class without it becoming a PowerPoint textbook to read and re-read with unclear organization. Examples of great teachers are Prof. Daniel Posen (importantly, in whose class I got a 68 but I can confidently say that was my own fault completely, as he is excellent), Prof. Mortazavi, Prof. Meyer, Prof. Amin Jafari, Prof. Roorda, and Prof. Touchie. These professors all share a great similarity in that they mix written examples with presentation visuals whilst teaching with a great passion. A passion that comes through in their efforts to convey the topics as best they can to people who are new to them. This characteristic is not found in the other professors (not mentioned) as they consistently rely on highlighting text they've already uploaded as a PowerPoint presentation. And, while they can seem like they care and are very well-versed in their field, their caring nature does not fully shine in and outside of class. I hope my comments are not seen as disrespectful but constructive.

- The most important aspect to learning has been having experienced and committed professors. For some reason this alludes me - this semester seems to have a lot of previous TAs who are subbing in as lecturers. They aren't horrible, but are worse on average compared to courses from past semesters, simply from a teaching perspective. Improving on that aspect should be prioritized.

- It would be great to have a source that tells us which mandatory courses are prerequisites for others; I know this can be found online but having it all in one place would be helpful! I know quite a few people who dropped certain courses and only later found out they didn't have the proper prerequisites to continue in the Civ curriculum (so they had to wait a full year to recuperate the credit, which ultimately added a full extra year to their degree). This happened even after emailing their academic advisor :(

- A lot of the professors are terrible at teaching and make the university experience much more challenging than it needs to be. Camp is extremely stressful and contributed very little to my learning because it was condensed into such a ridiculously short amount of time.

- I believe I'm very qualified to compare U of T Civil Engineering to other departments and other universities, as I've gone above and beyond the A.I. minor, and I also transferred in from [TMU]. Basically, I think there is not enough room for tech courses such as programming and Data Science at U of T Civil. There's tons of programming in industrial civil jobs, and also tons of data science (at least in transportation). The fact that I had to overload my schedule to learn these critical skills is a shame. Compared to other universities' civil engineering programs (I'm from TMU), we are still ahead as our faculty is much more experienced and recognized. Also we have a more breadth of academic options (clubs and course specializations).

- I personally didn't see value in Camp as a civil engineer. I think it provided a lot of unnecessary stress for such a high portion of our grade even though it was such a short duration of class. It was physically and mentally taxing and I truly did not see any benefit to my learning as a student here while being in that course. There is no way I can demonstrate my skills and learning over one week and have it be equivalent to courses I spent four months learning topics on. For those who struggle to learn and adapt quickly, this course really brought done our mental health and it affected our grades as well.

- I would like more flexibility in course load in third year. Taking multiple semesters of some topics was not beneficial to my learning experience. I would have preferred more choice in my technical electives.

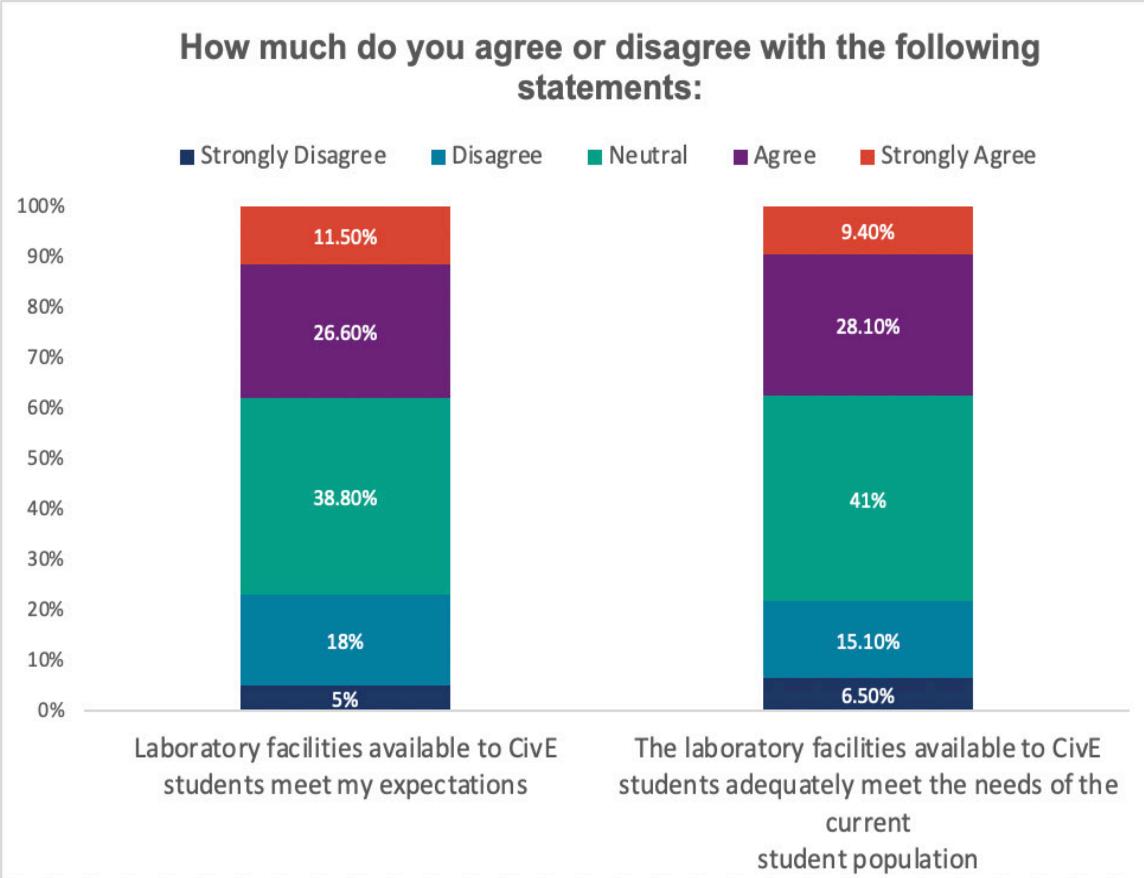
- The best-structured and engaging courses in my opinion were Material Sciences with Professor Scott Ramsey, Building Science with Professor Marianne Touchie, and CME538 with Professor Sebastian Goodfellow. The Camp course (CME385) was by far my least pleasant experience with my time in this program. Not only was it extremely unfair and structured poorly, it is disadvantageous to those who are not as physically able as others. It is a week-long course practical course that allows no room for mistakes or real learning. My experience in August of 2021 Camp 3 (the course restructured after COVID) left an extremely negative impression of the course as well as the teaching staff. My rotation (which was an all-female group) of the camp suffered through completing surveying in thunderstorm weather with wet terrain and were mistreated by teaching staff with no basis, while the other rotations had dry sunny weather (predominately male). We worked extremely hard with the knowledge we had and were not recognized at all for our efforts. In fact, teaching staff lectured us for not putting in enough effort, and added new (and difficult) practical tests that other rotations were not required to do. The teaching was inadequate. not conducive to our learning, and clearly biased. There seems to be an abuse of power within the course by the teaching staff, and the course feels unregulated. It is obvious when comparing our rotation's grades to other rotation's and other camps, as well as our usual grades, that it is an unfair representation of the actual work and effort that was put in at the camp. I recommend that the faculty reconsider the need or instruction for this course overall, as there may be reasons why other university's discontinued their course in their civil engineering programs.

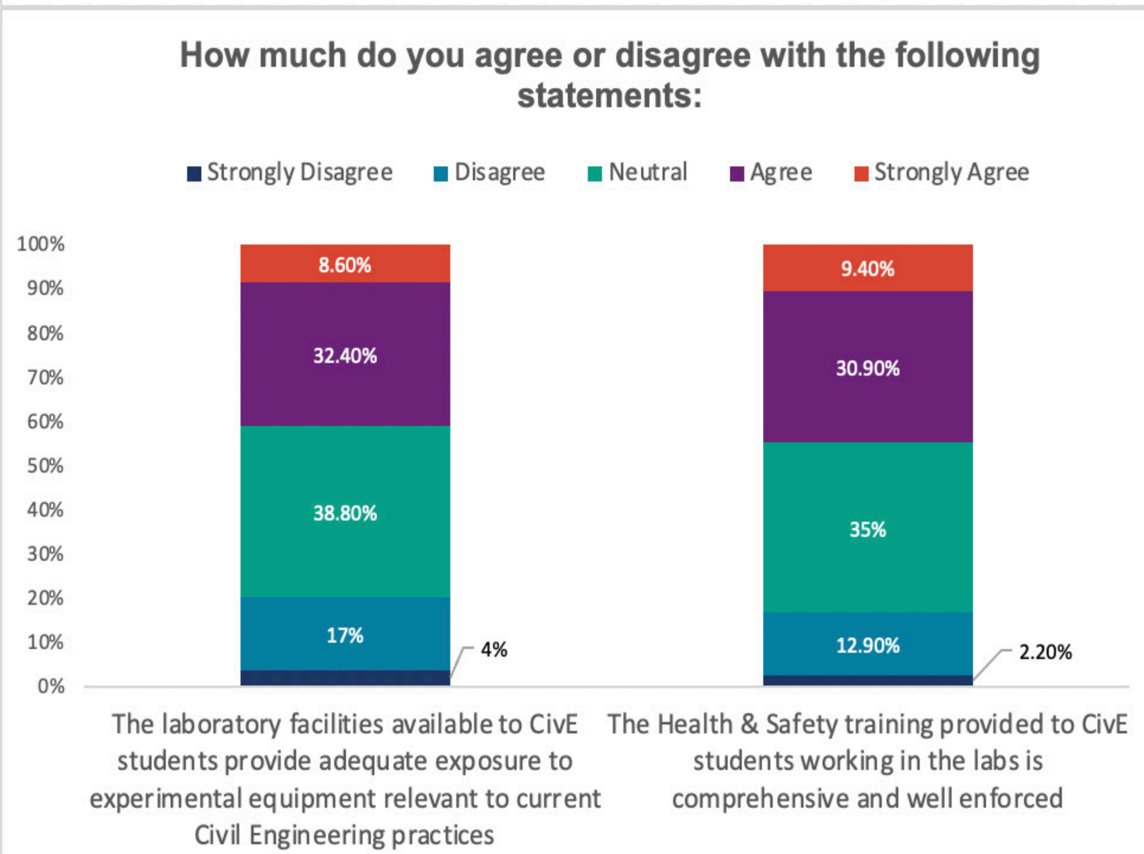
- Reduce class sizes in tutorials.

- Some professors do not dive deep into examples, which makes application of concepts sometimes difficult to really understand.

- The quality of the TAs hired should be higher. Some TAs on some courses are no help at all.
- Too many courses in one semester and lack of electives early on - makes it difficult to achieve minors and certificates.
- Would be nice to get more elective/choices in earlier years.
- I can't comment on electives, as I haven't taken any. The labs have been poor - I understand this has to do with the cohort size, but seems a missed opportunity, given that many experiments relevant to the material could be performed as home study (popsicle sticks are cheap).
- It is a very rigorous program with a heavy workload, but it is preparing me for the real world.
- I have not taken any electives courses yet, so I cannot comment on how well those are instructed. I would also wish there was greater crossover and integration between the different years of civil engineering.
- Had no experience with electives.
- Overall, I wish that there were more opportunities related to extracurriculars for Civil Engineering. For example, compared to ECE who often have hackathons which are related to what they're learning about, I think Civil should be involved with similar activities for students to engage in or even cross-campus/ university activities. Not only does this allow students to relax during the heavy work load term, but also enable us to discover what "kind of civil engineering" we are interested in becoming. Something specific: I think the CME262 professor should be re-evaluated based on his teaching capabilities. He often make mistakes during lectures and cannot answer questions (that are integral to understanding contextual knowledge) raised during lectures.
- I like the academics - I think it's pretty fair and honestly easier than other engineering unless it's me that's just doing well.
- Overall, I love Civil Engineering in general and U of T has made my passion grow even more. I'm grateful to be at this institution. The only complaint I would have as a Civil Engineering student is the lack of time due to highly extensive course loads (compared to other engineering programs), which results in less time to participate in extracurriculars such as clubs etc. I am also personally interested in an AI minor which is very hard to pursue with my current course load.
- Second-year professors have been more accommodating in terms of shifting assignment deadlines to account for midterms and multiple things from various courses being due at the same time.
- Lectures are very not helpful for some courses, and midterms are hard.
- I question if this program is over-rigorous. There was a lack of electives in my academic experience because I was already given many courses.
- More technical electives in related fields could be nice.
- The teaching quality of professors and TAs range widely from quite bad, to really good. I don't really know if my program is better or worse compared to other U of T Engineering programs and other universities. I heard that the CivE program apparently has friendlier students than most of the other U of T Engineering programs though.
- Not everyone who has a PhD can teach clueless students. A lot of the teachers we have this year are great at what they do, but they don't know how to project their understanding onto our [classes]. It's a layering process. Not reciting.

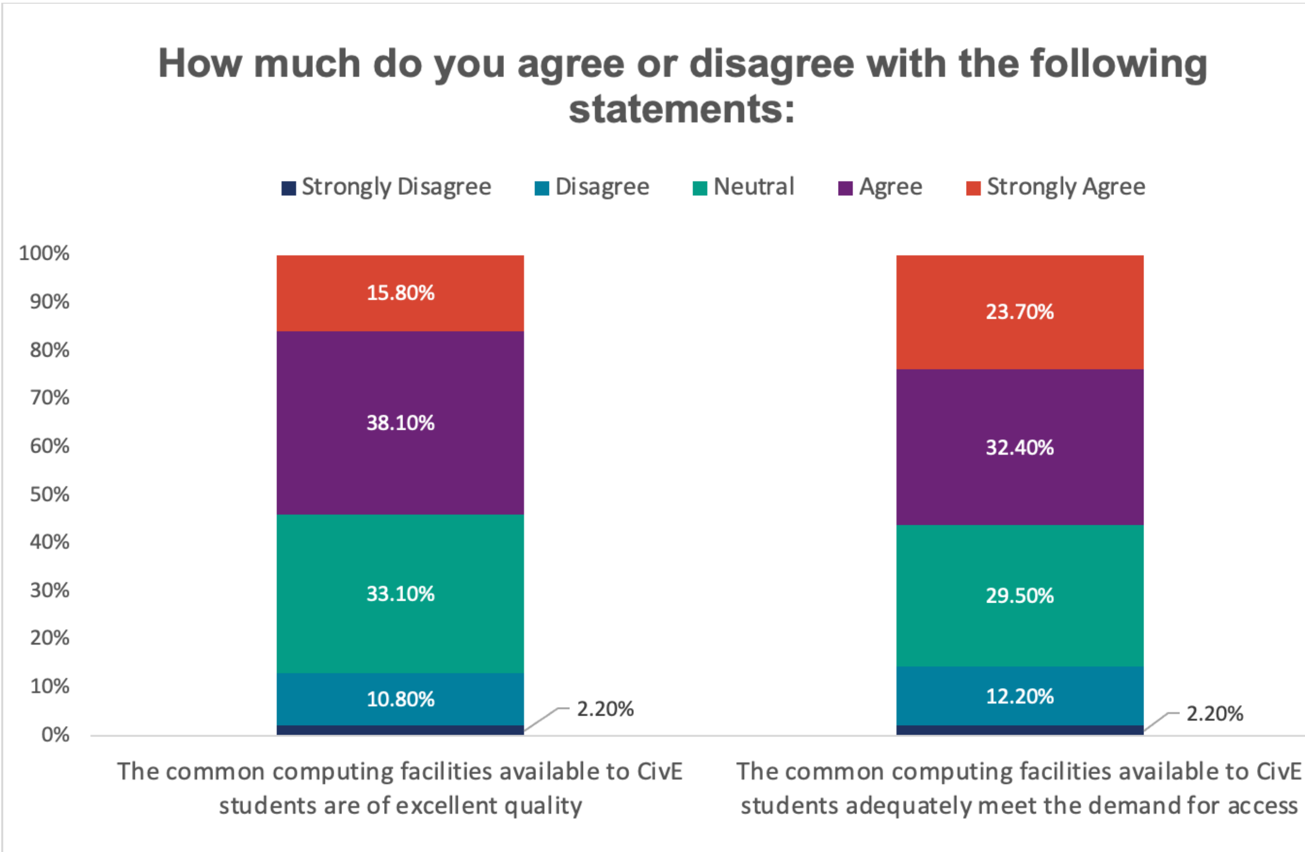
Laboratories:





Is there any further comment you would like to make about the department's laboratories?

- They do not allow students to get hands-on experience and actually learn the equipment.
- The labs (especially the soil labs) are not well taken care of, and the materials are broken.
- Pretty outdated.
- We don't get into the lab enough, and are pretty restricted in what we can actually do in labs. The best ones were probably CIV342 (water and wastewater treatment).
- I think there should be more, especially for the materials course, and should be more organized and hands on instead of just giving data.
- Students should get more hands-on experience in labs. Courses often take students to lab, without the students actually doing anything. They just stand there and watch the lab being done by someone else. This isn't helpful for learning.
- The Geotech labs are the only reason I didn't give a 5. They are dusty and the labs are run in a nonchalant manner because we can't really do the labs ourselves.
- Not a major part of our curriculum at all, but not fussed about that. While cool, many civil engineers will never step foot in a lab and those who will seem to learn by the great research opportunities available at U of T.
- While I am sure the University offers great tools and laboratories to its students in its courses, I would have liked to experience them in all my (appropriate) courses such as CIV312.
- Geotechnical lab rooms are cramped and messy, and at least one machine is broken every lab.
- The Civ labs need better equipment.
- Need better equipment.
- To be honest, I haven't had much classes in laboratories facilities, but they have been adequate enough.
- U of T needs new lab materials and more space.
- Would be great if we had actual experimental exposure.
- Labs are boring and impersonal also unrated to the course content (CIV209 only).
- I think all the pieces of lab equipment are pretty old and out of date.
- Haven't used them sufficiently to judge.
- I feel like here is the lab equipment needed for our education, however, we just don't really get to use it and anytime there is a technical lab we just watch the TAs conduct it.
- They're mostly really old and sometimes there isn't enough room for everyone to properly participate.
- Get working equipment.
- Even though they are called labs, we usually are the ones watching TAs do things. It would be more comprehensive to have stations and do things ourselves.

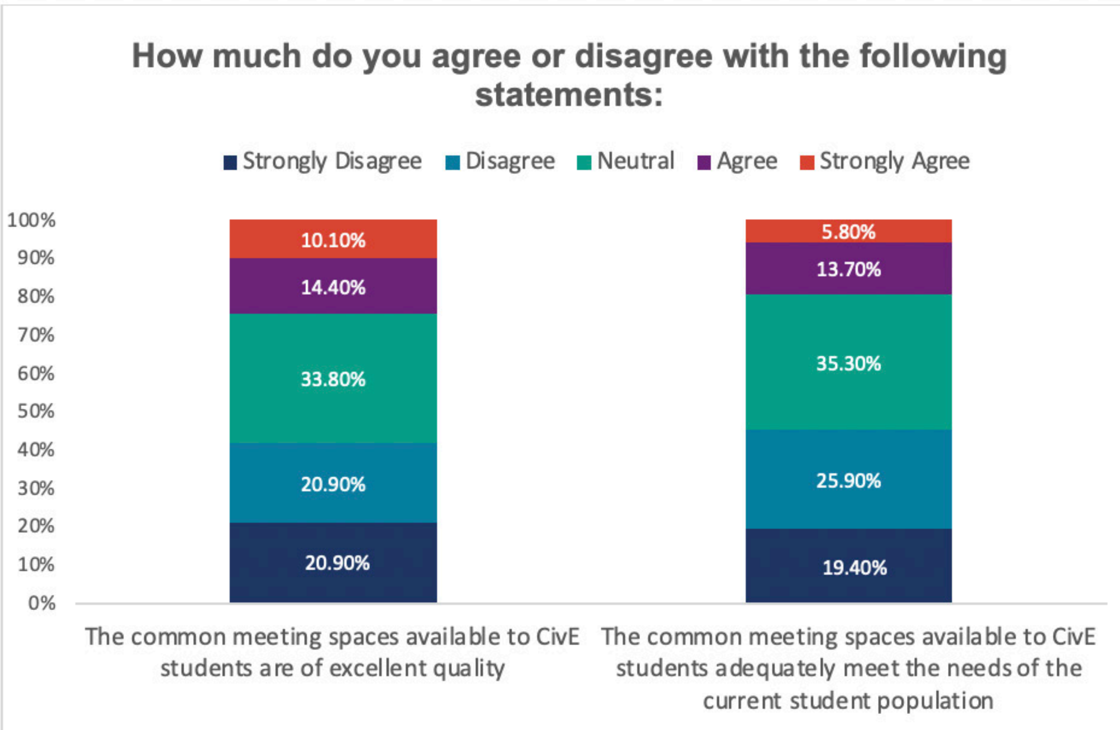


Is there any further comment you would like to make about the computing facilities?

- Printing is never really available.
- MB400 machines are falling apart.
- Allow students to freely use MB400 again.
- Printers never work.
- I've never been to MB400 outside of class, but it's nice to know it's available? I think (you used to need a fob)?
- They are good. But can't control brightness and such which is gives me and other students headaches.
- Have our own computer lab.
- More computer, faster speed.
- Students should not have to request special access for MB400.
- They are often inconvenient to access like the Mining Building ECF computers as the facilities present in Galbraith/Sanford Fleming are Linux-based, making them useless for running programs such as AutoCAD, ArcGIS, and basic Microsoft Suite.
- SF computer lab should NOT have Linux as its operating system. Almost no one uses it and it makes it hard to work on school work. Only good thing it has is a colour printer.

- Make sure programs that we need for class are on lab computers.
- The CivMin computer lab in MB400 cannot be accessed unless you have a fob, and a fob is not provided to Civil Engineering students, so we don't get access to our own lab, which makes little sense.
- We do not have access to the Min Lab, unlike the Lassonde Mineral Engineering students, which doesn't seem very fair.
- More printers should be available when labs are booked.
- The ECF labs are satisfactory but often are unavailable due to class bookings.
- Oh they're great, I love the Mining Building computer room, but I wish It was available during regular hours.

Common room/Student Club Facilities:

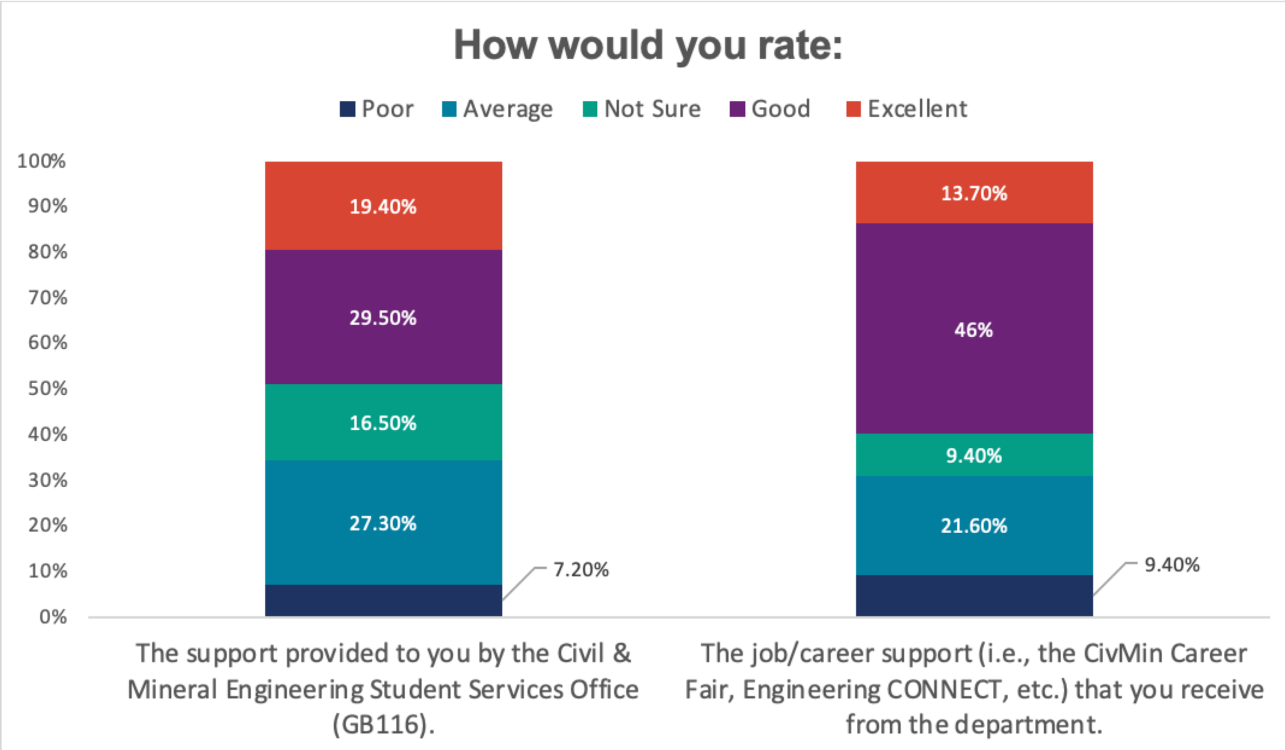


Is there any further comment you would like to make about the common room or student clubs facilities?

- The common is ugly and needs more funding.
- Too small, and horrible in comparison to other engineering common rooms.
- We should probably put in some sort of cleaning schedule because currently that place is just filthy.
- If possible, a bigger room would be better with more study spaces.
- Common room is old and outdated.
- The common room absolutely needs to be cleaned by caretaking - it's part of the University, and the floors just get super dirty over time. Currently any cleaning is done by students.

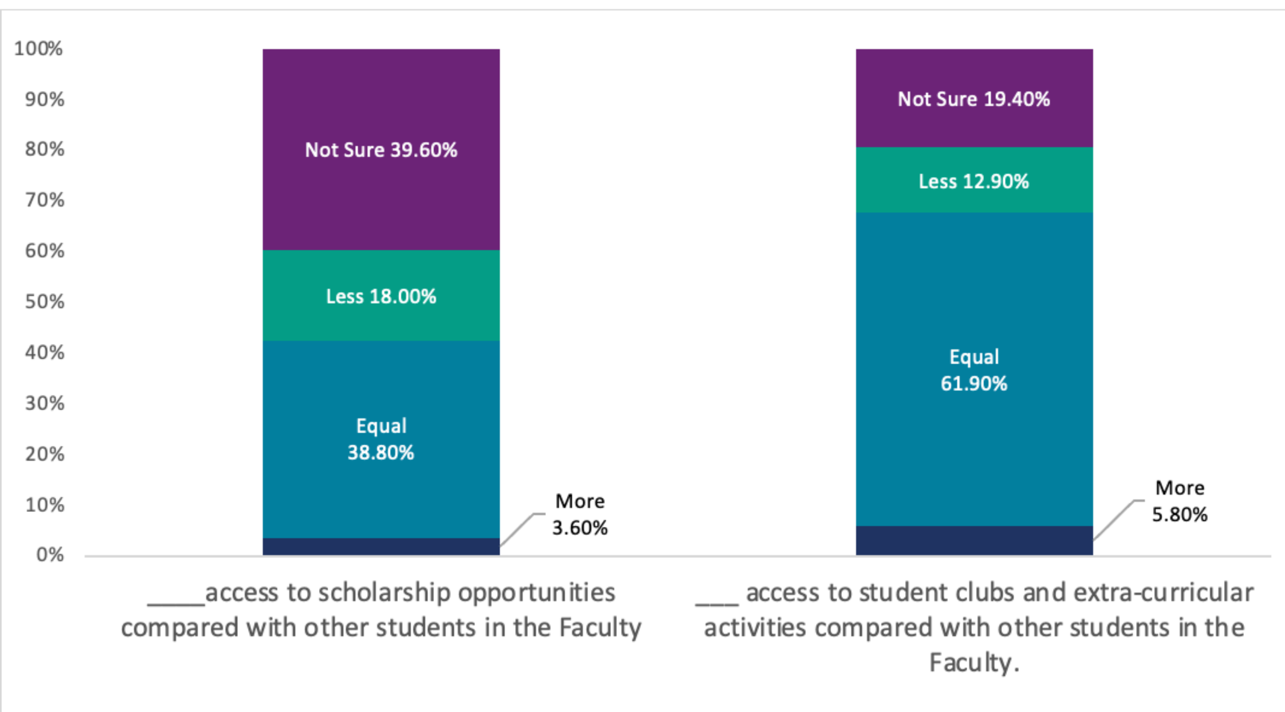
- Common room is too small and smelly compared to other common rooms.
- I'm not sure if there is much that can be done as it is largely due to other students but the common room is rarely clean and often overcrowded.
- Doesn't seem like we have great individual space outside of MB400 but that space itself is great.
- The common areas available to Civ students are often the "Pit" in Sandford Fleming and some seating areas in the Bahen building. These and any other areas (other than the Civ common room) are usually ineffective workspaces and are not aesthetically pleasing due to the colour scheme and cleanliness. Generally, it is hard to think of Civ common space areas that are located in Civ buildings as they don't exist in Wallberg, Mining Building, Mechanical Building (a bit inaccessible), and the ones that are in Galbraith are often gloomy and are subpar compared to the clean and open plan design of a meeting space such as in the Medical Building / Donnelly Centre.
- Common room is nice, but is underfunded and is limited in space.
- The Civil Engineering common room needs to be deeply cleaned. It is very dirty.
- Improve the aesthetics.
- The common room is often packed with students and there is insufficient seating.
- The common room offers many nice facilities such as a foosball table, vending machine, Wii, and couches, however it is often packed with students during day hours and difficult to find space to sit and work.
- The common room is too small, there are too many people.
- Need a bigger common room.
- Its too small.
- The common room feels small and often fills up. Wish there was a larger space for Civil students to congregate.
- Better common room.
- Make it bigger pls!
- I want mega Jenga.
- Bigger common room.
- A vending machine or a pool table would be good.
- Common room can get easily crowded.
- Need more funding.
- There could be more sitting/study areas in Galbraith.
- More seats. Renovation needed. It is nothing dose to the Chem common room.

Student Experience:

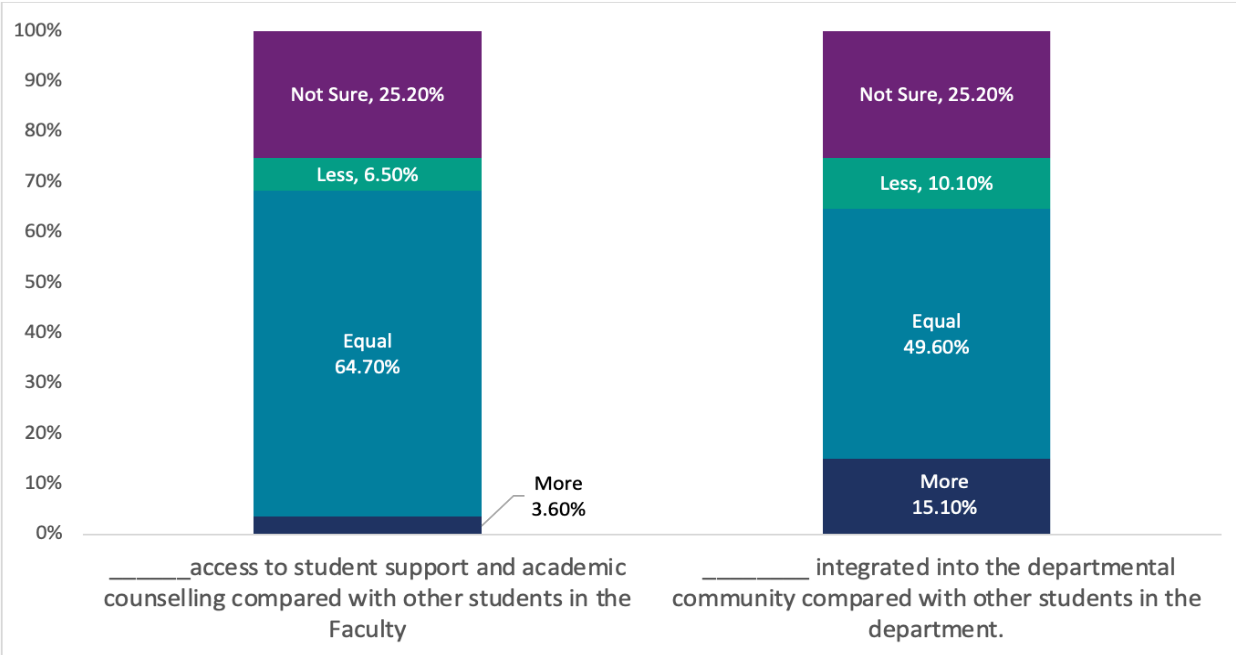


a) Students in the CivE program have ___________access to scholarship opportunities compared with other students in the Faculty.

b) Students in the CivE program have___________access to student clubs and extra-curricular activities compared with other students in the Faculty.



c) Students in the CivE program have______________access to student support and academic counselling compared with other students in the Faculty.
d) Students in the CivE program are______________integrated into the departmental community compared with other students in the department.

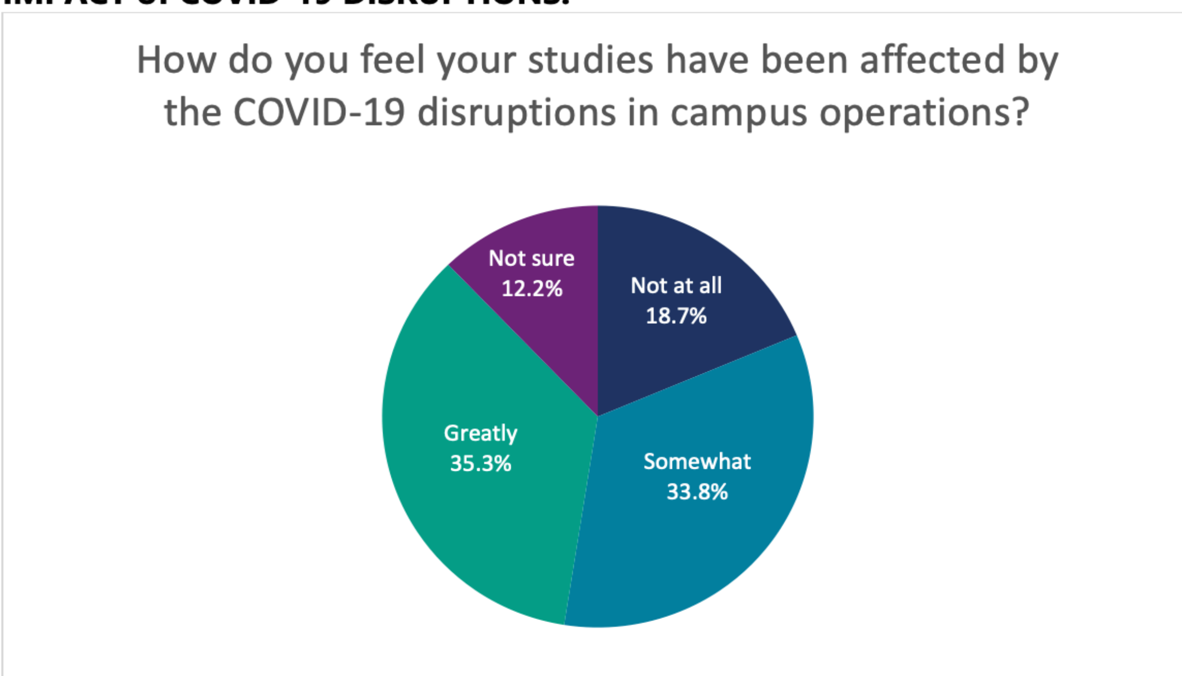


Is there any further comment you would like to make regarding your overall student experience?

- Had some problems personally and have heard widespread concerns about not getting proper guidance from [advisor]. Either hearing about students not finding out until midway through term about not having enough credits to graduate, or being told incomplete advice about potential courses to drop.
- Poor. The quality of education that I'm getting at U of T does not reflect the amount of money I'm paying for my education here.
- The CivMin admin/staff (Nelly, Phill, Yana, Galina) have been nothing short of wonderful. Best part of the CivMin department.
- I think more help with picking a career path and understanding how to tailor courses towards a career path would be helpful.
- It would be great if club fairs were more often or better communicated through emails and announcements. Currently, I am unaware and find it difficult to find any information relating to support regarding technical issues and general questions about my program (not all 120 Civ students can bombard [advisor] with questions on the same day and yet I do not know about anyone else to contact regarding questions about my program, so it would be great if it was conveyed more clearly).
- Please stop incorporating large breaks in class schedules, or find a way to give future students some freedom in their timetables.
- I had some email miscommunications, such as being dropped from a course when I stated that I did not want to be dropped from the course. I found it difficult to get all of my questions answered through email.

- Shayni has been a huge help over my undergraduate career.
- I have had very little involvement with the Department or in any extracurricular activities.
- I noticed that at job fairs, there usually limited companies from Civil, like one to two. I wish the organizers reached out to more companies.
- The people are great.
- As an international student I have not been able to connect with a single scholarship. I have not come across one student who was able to get a job through the portal. I know a lot goes into it, but honestly its not helpful whatsoever. I am having a hard time organizing my minors. For some reason academic support there feels low, despite the opportunities I have available. There is this “leave it to the fourth year to worry about” attitude, and for some like me who overthink and likes things planned out ages ago, it gives me so much anxiety. If you search “CivEng Undergraduate Courses at U of T” you will stumble upon many websites some saying different options for fourth year. It causes a lot of confusion. Having one page, a student can go on with a dropdown lists like you need to take one of *these* courses not “CS/HSS elective”. It’s very confusing!! Took me months to comprehend what CS/HSS and Free electives are. I wanted someone who knew all the rules to walk through my plan with me, and all I get is “don’t worry about it now” and then an email saying the choice I made was not the right type.

IMPACT of COVID-19 DISRUPTIONS:



If you answered “Somewhat” or “Greatly” to question the above, please comment on how your studies have been affected:

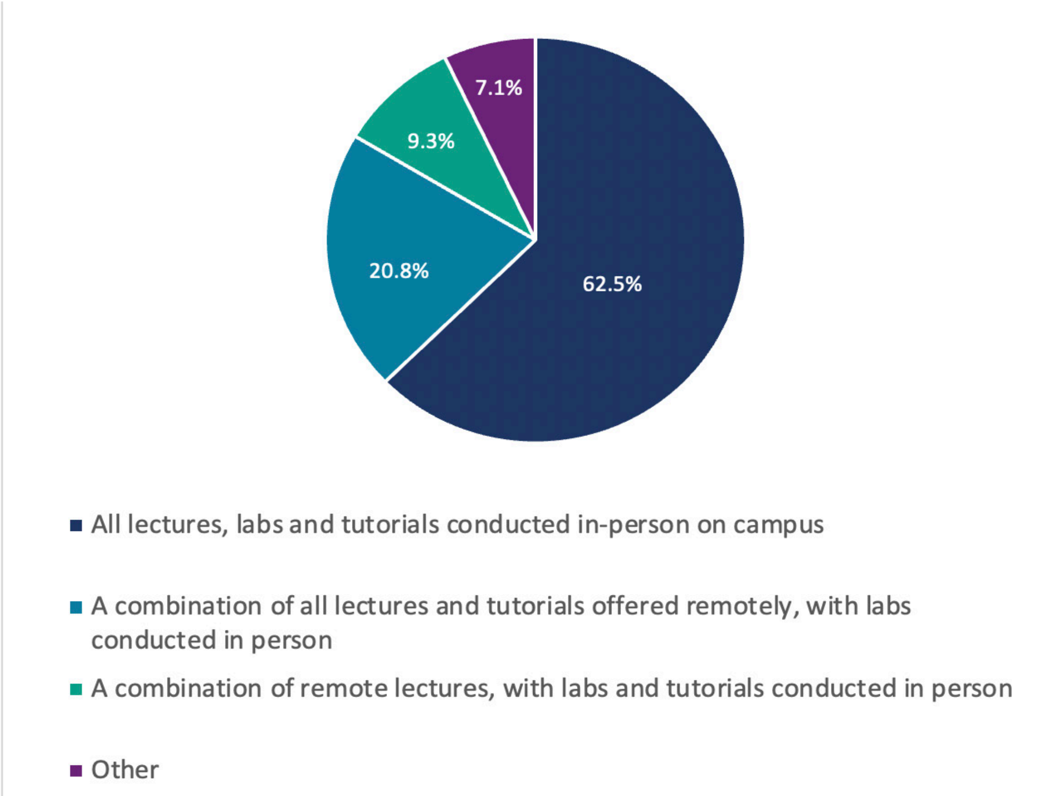
- Resulted in many new professors teaching courses (or non-professors teaching courses), providing a lower quality of education due to their inexperience.
- I can’t learn without recordings as well.
- I missed out on a lot of labs and other in-person experiences.
- Lots of first-time professors and online learning didn’t really cement the required knowledge to excel.

- Missed out on hands-on activities first year.
- Lecture experiences were terrible. Tuition should have been lowered.
- A lot of classes went online and had a negative impact.
- Lack of opportunity to participate in labs, several classes that were held on Zoom weren't as good as in-person courses.
- Online lectures made for terrible learning conditions.
- My first year was online, which was terrible in my opinion. Tests were unreasonably hard and there was no social aspect to school.
- Online study is not effective as in-person [classes].
- 2020-21 yes. After that not any more.
- There's definitely less of a student culture now than before the pandemic. I definitely appreciate having access to lecture recordings.
- Online learning didn't let us have as many hands-on experiences as possible.
- Interactions and engagement lacked throughout this time.
- Every online course I have had I ended up with marks significantly lower than any other course, and as such I am in a much lower standing than I would like to be when trying to get into grad school.
- First year, and part of second year, was so tough. I don't think I could go back to that style of learning, it felt very unengaging and lonely.
- Having the entirety of first year online was very hard in terms of learning and social [experiences]. Similarly, the 2022 Fall exams were cancelled, which affected overall mark distribution and didn't give me a good chance to showcase my understanding of course material.
- Couldn't gain good foundation so it is carried over throughout the years.
- Quality of classes online was greatly reduced compared to in-person classes.
- Teaching quality has varied a lot.
- Mainly first year threw our start to university off, and being put online for the beginning of second semester was rough.
- Since COVID caused us to miss first year, we have a much shakier understanding of the basics.
- Feel overwhelmed and stressful for the school work.
- We had to have some lectures online, but those weren't too bad.
- Needed traditional classroom setting. Lack of connection to material.
- Online exams with no time limit.
- I didn't try very hard during COVID years and that slightly impacted my abilities going forward.

- I feel I learned a lot less and there was a lot of extra work that was not there in previous years with little additional educational merit.
- All of third year was online, which made for a terrible learning experience. The only positive was that third year is quite heavy and so the online flexibility felt like it was the only thing that got us through.
- Going from online format and transitioning back to in-person classes was incredibly jarring.
- COVID-19 was a drastic disruption to studies. Not only did it impact our ability to learn, it also added a new level of difficulty with socializing and getting peer support. I feel that in-person learning and having areas such as the common room are crucial for the success of students, and their ability to retain the information they are being taught.
- I actually enjoyed online classes, since I save three hours from my commute. Professors should post recorded lectures more often.
- COVID-19 disrupted my overall learning experience in second year for Probability Theory as it made it harder for the professor to convey what he wanted to over an online interface. This was a common trend in first year as well, where teaching was relegated to a re-watching of videos that were recorded and a general lack of connectedness.
- I had struggled to manage my university course load and continued to fall behind in my courses. Also, a lack of student community and engagement with peers led me to feel isolated.
- I feel I’m one of the few students who preferred online learning over in person. Recorded lectures were so helpful.
- I felt like I had less of a hands-on experience in second year when we were fully online.
- I have gotten used to online lectures. Even though I haven’t had online lectures in a while now, I believe it has impacted my methods of learning overall.
- Not enough socialization.
- Lack of interactions.
- Meeting people and being in person - loss in value.
- Loss of class communication and discussions in second and third year.
- Lectures and exams online can be stressful and difficult to manage/ stay motivated, but it was manageable. Camp’s format and course was completely changed due to COVID.
- Hybrid learning was not interactive enough for my learning and overall experience. I believe nothing can replace in-person learning.
- In first year we were online or on campus as much which affected learning.
- Impacts on learning (mostly during hybrid modules/lectures due to campus closures).
- More online classes instead of in person.
- Online lectures made it harder to learn in second semester during first year.
- I learn much better in class - doing courses online I feel was disadvantageous to my learning.

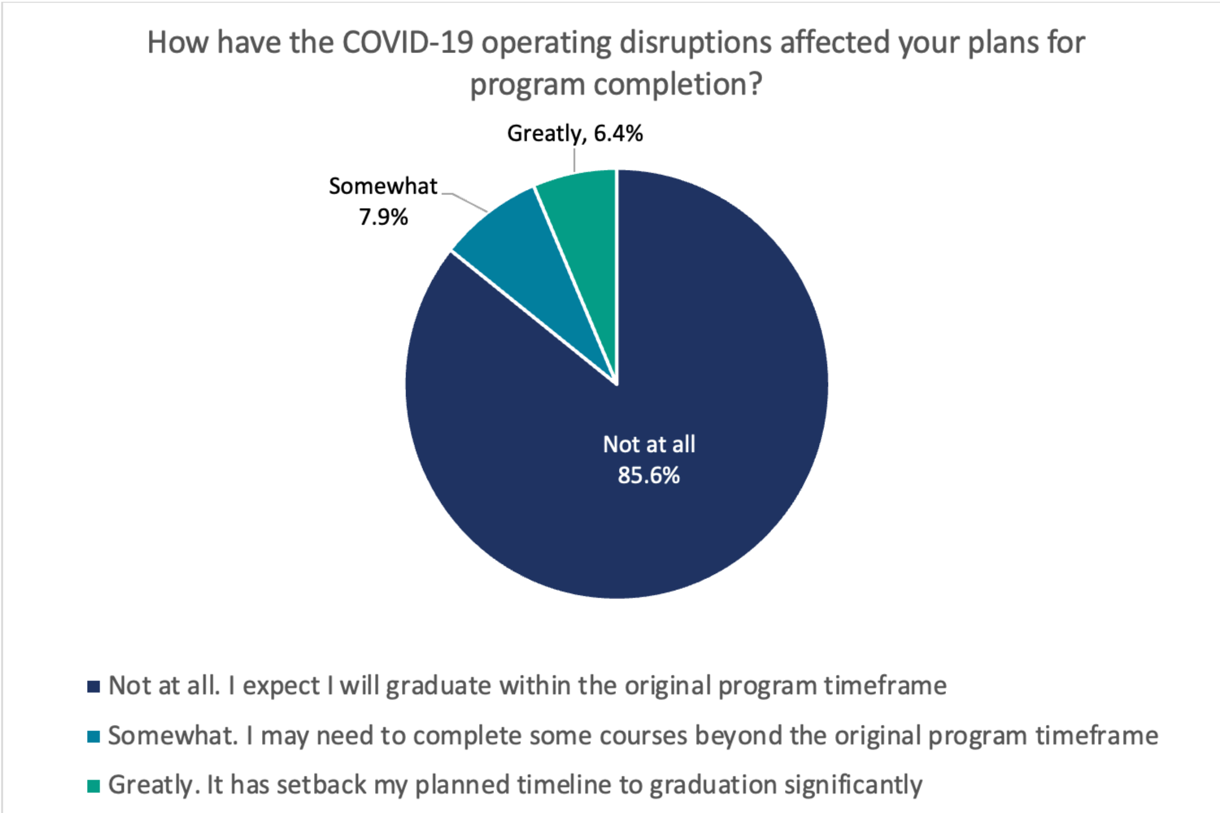
- Final exam was cancelled in 2021 fall semester.
- Video lectures are not equivalent to in-person classes.
- Being partially online last year has negatively affected my learning this year.
- I was a student in 2020 winter semester I had to learn how to do it all isolated from home.
- Zoom lectures are harder to follow - not as much support to go over problems.
- It was chill, I still went to campus and made friends.
- Affects scheduling.
- Less motivated, not prepared to write extensive exams.
- Online schooling is a different experience that comes with both advantages and disadvantages.
- Wearing a N95 mask all day, every day whenever I am on campus is consistently uncomfortable. Plenty of other students have serious coughs and symptoms but don’t wear masks, so no other option for me.
- I mean it affected learning inhibition a lot, with just exams being offline it felt like a lot to catch up and made the learning process less comprehensive and more of a burden.
- I passionately hate online learning.
- Lack of understanding due to differences in time zones.
- I find it hard to do online courses that then got converted into in person. In second term of my first year I struggled heavily, getting put on probation.

That campus activities have resumed to normal operations, which approach to learning do you now feel is most beneficial to you in terms of successfully completing your program:



If you answered "other" to the question above, please comment here:

- Everything in person with recorded lectures posted.
- Mostly in-person classes with recorded lectures.
- In-person classes with recordings. Those who don't attend because they can watch the recording probably wouldn't have attended anyways, or at least not really pay attention. Then if you miss class for whatever reason or just want to skim through some parts of lecture, you can check recordings at your convenience.
- I think option A (everything in person) is definitely the best option, but the addition of recorded lectures (whether it be past year's content recorded during COVID or recordings of current lectures) would also be greatly beneficial. During COVID, students got used to watching recorded lectures multiple times to help understand difficult material, which is something that is missing now that we have returned to in person learning.
- Make it mandatory that lectures be recorded.
- Lectures and tutorials that work on graded assignments.
- Generally, I prefer everything in person, but with much less mandatory attendance.



If you answered "B" or "C" to the question above, please comment on how long this has set back your timeline for program completion:

- Just one year.
- I am taking an extra year having dropped to part time in second year for online classes.
- Not necessarily due to COVID, but I decided for my mental health, I extended my completion date to four more years.
- It delayed me for a year.
- One year late.
- Two years.
- Two years.
- Possibly an extra term if I don't complete the missing courses during the summer.
- One year.

DIRECT STUDENT COMMENTARY

FINAL THOUGHTS OR ANYTHING ELSE THAT WE MISSED?

- It's been a rough ride with all the first-year professors we've had.
- Overall, it's been a good experience.
- Not enough scholarships for male students pursuing a bachelor degree in Civil Dngineering.
- CIV313 professor right now I think need more improvement as he was somewhat insensible during a medical incident of a student and seem unprofessional in handling students. His teaching is quite unstructured as well.
- GB is falling apart. The pit looks like it's from a third world country. Can we have some more modern facilities, and also make sure all the washroom toilets work properly? Thank you.
- Concerns about the new PEY program
- Concerns about not having enough Civil opportunities on the job board
- Concerns about accessibility and meeting the needs of disabled students
- Should have given students more time to live a life.
- U of T Civil Engineering is one of the best programs in the country in my opinion, however, COVID greatly impacted my ability to excel in this course and therefore my ability to get into graduate studies. I have still learned so much and am very prepared for joining the work force.
- Great here at U of T Civil Engineering.
- Overall, my experience in the Civil Engineering program has been amazing. Courses are interesting, content is well organized, many extracurricular activities to join, and more. My only criticism is that some courses are taught by professors extremely well, whereas some are the complete opposite. I feel like professors need to be properly screened to see if they can actually teach and communicate properly before handing them 100 students who they simply cannot teach effectively. Simply having someone from higher up sit in a class being taught by professors to get a glimpse of how some professors teach, so they can understand how unprepared/in equipped to teach some professors are. I understand professors need to do research as well as teach, but some professors seriously need to be monitored for how they teach. In terms of how they deliver the course, explain concepts, and treat students. Similarly, I found that a majority of TAs are completely useless. When leading tutorials, they are quiet, don't really know the content, and aren't prepared. TAs should be sociable, be able to properly communicate, and be extroverts in order to effectively help students. A more in-depth screening process needs to be in place instead of simply assigning TAs based on who they are doing research under.
- I think there's a good community but it's disorganized when it comes to courses.
- Get the Civ [Club] common room an upgrade!
- Having more recorded lectures and tutorials can prove very useful because some lectures/TAs talk or teach too fast. Or some information is so dense that an opportunity to watch a recording is really appreciated.
- Incorporate more practical information about the different industries in Civil into the curriculum instead of having it as something ancillary after classes or in panel talks. A more in-depth look into the potential career paths would be greatly beneficial in second and third year to have better idea and more educated decision.

- We really need to have better access to non-structural sides of civil engineering and be allowed to choose tech courses in third year.
- Workload and peer pressure.
- The overall program for Civil Engineering students is great. However, the [Civ Club] common room needs some improvements when comparing it to other programs like the Engineering Science common room.
- Please make it more abundantly clear about the options available to us for our program in greater detail than just posting a link to the CIV courses calendar that I can easily search up by myself. For example, even after consulting with my peers and profs and advisors I only recently found out that the number of courses that can be picked in fourth year are 3-4 for each semester with a design project. There is not enough information about how exactly things will pan out in the future in our program. Furthermore, course selection is often marred by inaccurate information regarding CSS/HSS course scheduling and guidance on how to pick them and what to do if it is unavailable to enroll in them.
- The PEY co-op program should implement more flexible co-op work terms (4 and 8 month terms) to stay competitive with students from other universities and allow students to explore different work opportunities.
- MAKE RECORDED LECTURES MANDATORY. PROFS SHOULDN'T CARE ABOUT STUDENT ATTENDANCE, IT SHOULD NOT AFFECT THEIR ABILITY TO TEACH. In-person labs and examinations are fine.
- Maybe a question related to our Camp experience?
- My experience in Civil Engineering at U of T has been, frankly, not okay. If I could go back to high school, I would choose to complete my Civil Engineering degree at a different university. I have enjoyed, learned and done my best in classes where I have completely disregarded lectures and self-taught myself the material. I sincerely think its a problem when lectures, videos, or textbooks (found online and not given by the professor) are better resources than the professor's actual lectures. The only positive aspect of this degree is the design projects integrated within poorly managed and taught classes. The projects are the only opportunity where I feel like students have a chance to fully explore and understand the material. The professors and TAs only provide surface-level assistance and are not approachable with any significant problems. In all my years at U of T, I have only met one professor that fully supported and cared about their students. This program does not care about the mental or physical health of its students and faculty. This program does not optimize the experience for both the professors and the students - the professors are not being used to their full capabilities and students are being taught material in a way that is completely futile. I sincerely wish I had a different experience, but I would not recommend this program to any student wishing to pursue engineering because it will destroy their passion for learning.
- I had a pretty average experience but most of the disconnect was due to moving online because of COVID in the middle of my second year.
- Less exam, more project [sic].
- No. I think the overall experience is quite good and the people are good.
- Allow for streamed learning earlier on in the program.
- From what I hear from students in other university engineering programs (including prestigious American universities), the workload at U of T is much higher. It can feel overwhelming, and also confusing, as to why we need to work harder for the same quality degree.
- I am very happy study Civil Engineering at the University of Toronto. It has been a great experience so far.

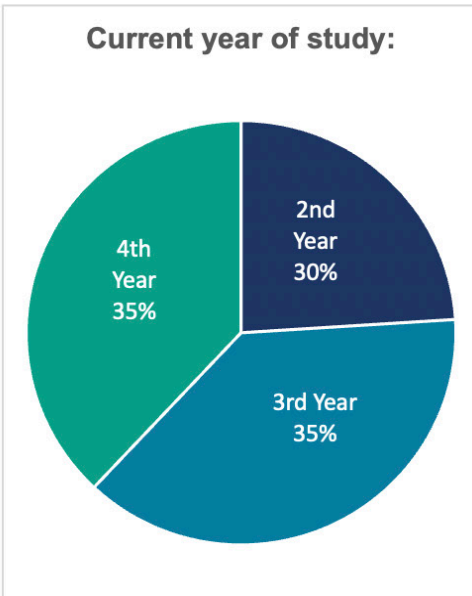
- Good overall experience from the faculty and academic experience as a whole.
- CivEng best Eng! [sic]
- Some professors or course instructors are not good.
- Don't have the Career Fair when Civ students have class, give us a proper lunch break (not at 2 p.m.) and no two-hour lectures and no class after 5 p.m.
- Labs often have little relation to content learned in class and are poorly explained and executed.
- COVID hasn't been the biggest challenge for me personally. It was not being able to transfer out of Chemical Engineering sooner. Also, we haven't had electives yet, so I can't say if they are satisfactory.
- Greater introduction and easing TrackOne and transferring students in Year 2.
- Sometimes the professors might not introduce the topic completely which can make it confusing.
- Decent program requiring some review on teaching staff and scheduling of courses.
- A lot of courses, but it's not terribly academically rigorous. Definitely doable.
- Love Civ <3 hopefully I get to do research in the field I like!
- The course schedule needs revision, as we do not have time for lunch.
- Love my program :)
- It's hard to find internships in second year and I feel it is very hard to find that experience in my university life which companies demand from interns.
- Our tuition shouldn't include parking and the PEY Co-op portal is terrible.
- Reducing the worth of exams.
- The buildings need to be cleaned more often.

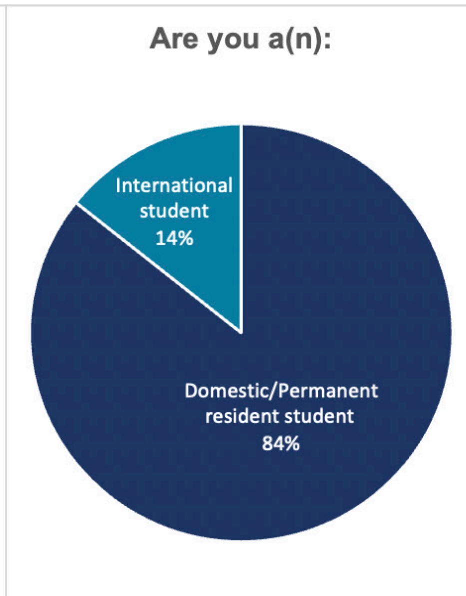
Appendix: A.6 Department of Civil & Mineral Engineering Self-Study 2022 Survey Results Undergraduate - Mineral Engineering

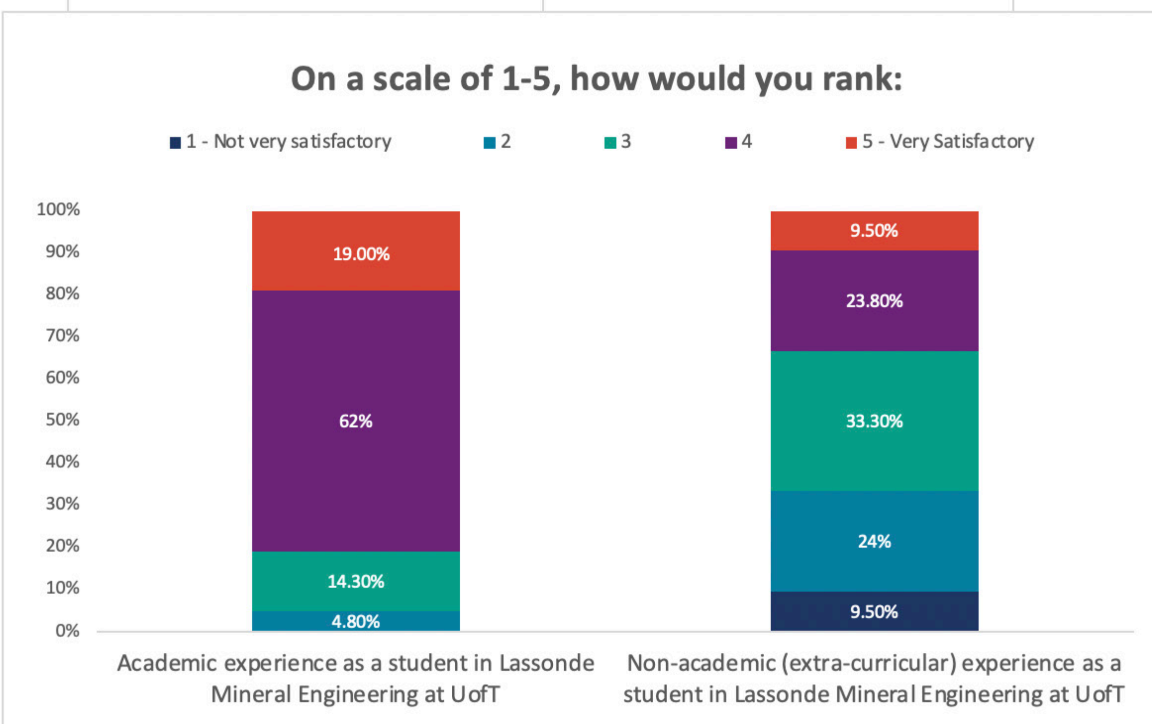
DEPARTMENT OF Civil & MINERAL Engineering

Self Study 2022-23 - UNDERGRADUATE STUDENT Survey

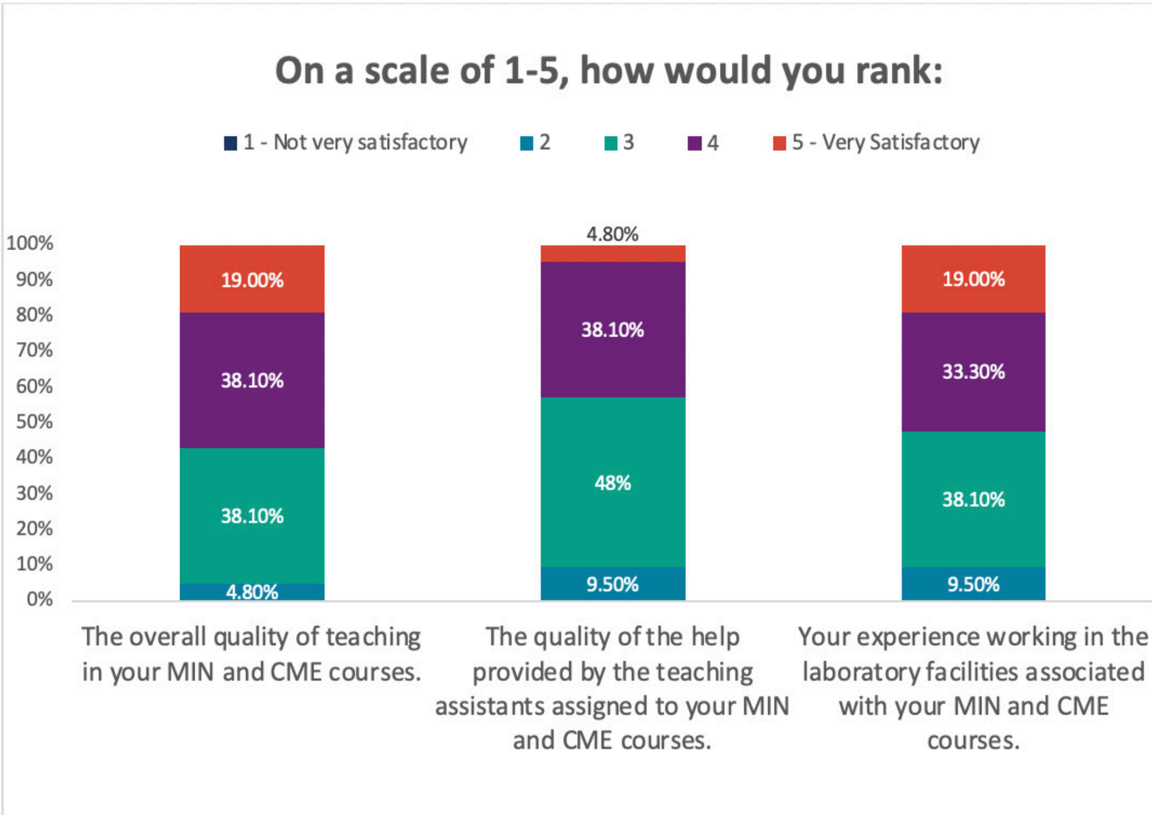
ABOUT YOU:



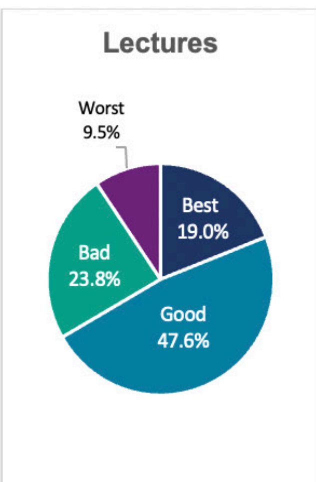


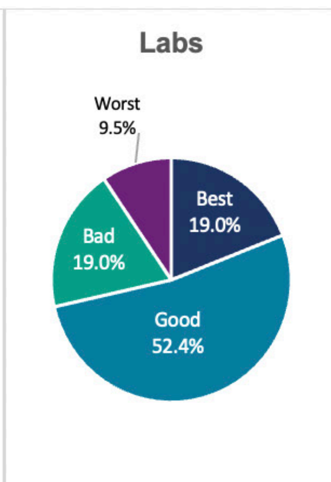


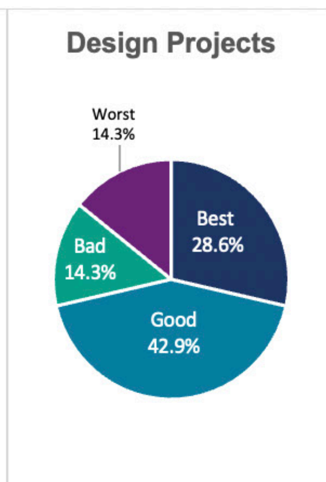
ACADEMIC EXPERIENCE:

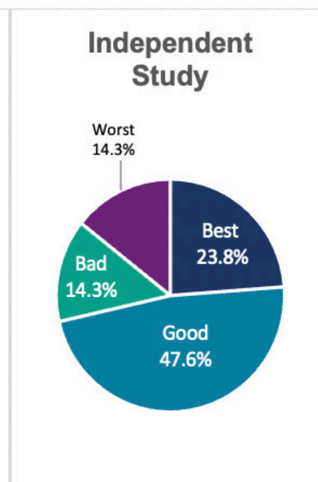


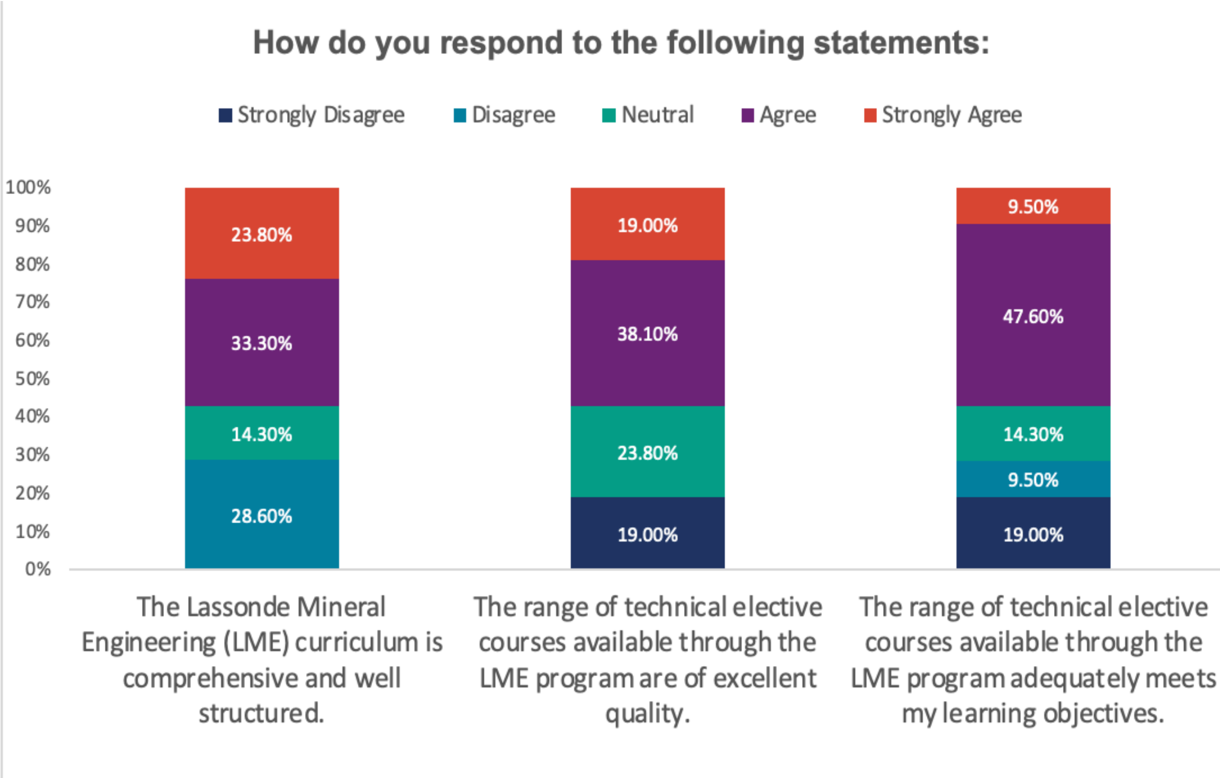
In your experience, what types of academic activity have provided the best formats for learning in your MIN and CME courses?

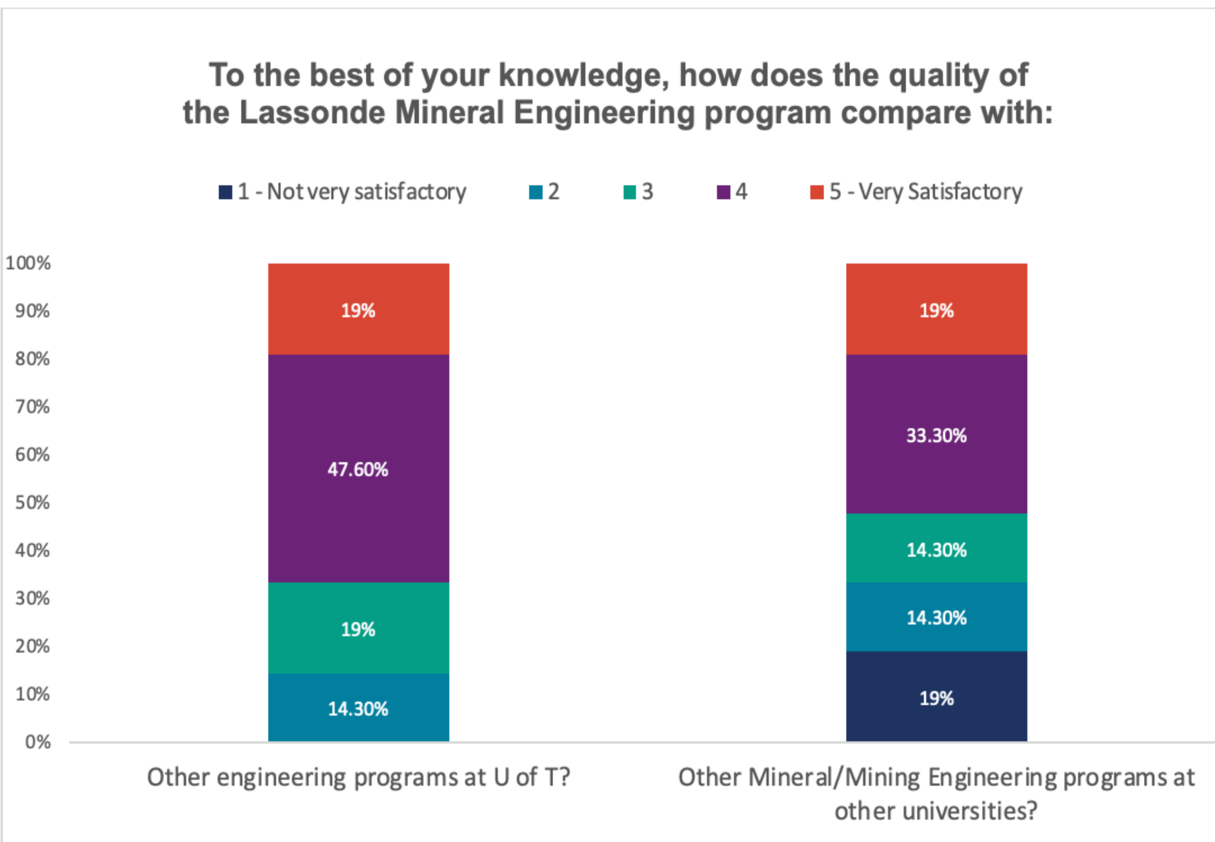









How do you respond to the following statements:
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
23.80%
33.30%
14.30%
28.60%
19.00%
38.10%
23.80%
19.00%
9.50%
47.60%
14.30%
9.50%
19.00%
The Lassonde Mineral Engineering (LME) curriculum is comprehensive and well structured.
The range of technical elective courses available through the LME program are of excellent quality.
The range of technical elective courses available through the LME program adequately meets my learning objectives.


To the best of your knowledge, how does the quality of the Lassonde Mineral Engineering program compare with:
1 - Not very satisfactory
2
3
4
5 - Very Satisfactory
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
19%
47.60%
19%
14.30%
19%
33.30%
14.30%
14.30%
19%
Other engineering programs at U of T?
Other Mineral/Mining Engineering programs at other universities?

Is there any further comment you would like to make regarding your overall academic experience?

- In large part, the Min courses are great. The CME courses have a long way to go for the LME program. As they currently stand, they are Civ courses that LME students happen to be in.

- Min courses and instruction is excellent (most times), CME courses are poorly structured and lack mining-related content.

- Min courses are structured well, however CME courses are poorly structured.

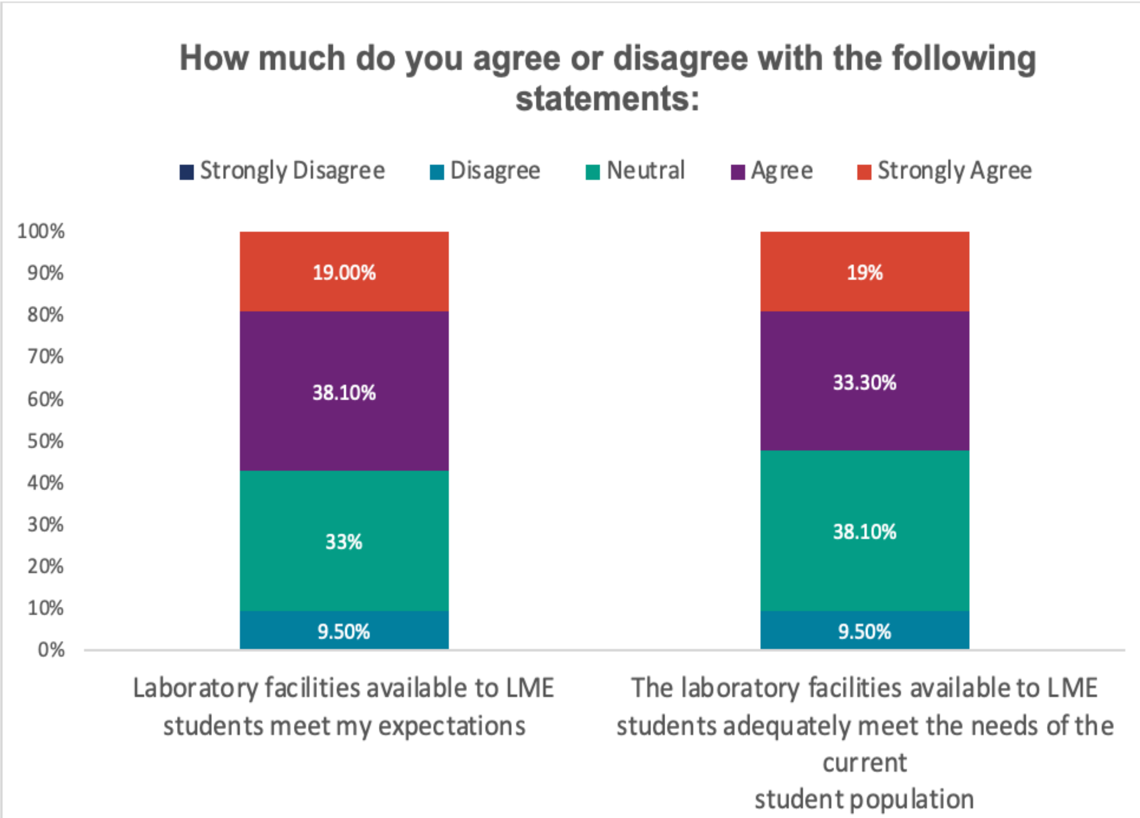
- I think the biggest problem at U of T Lassonde Mineral Engineering is the complete lack of coordination between professors. This semester I have four Min courses and yet from those four, we have three midterms in three days whilst the rest of the semester is empty. This shows a complete lack of effort and care to coordinate and shows a lack of care toward students by causing immense undue stress.

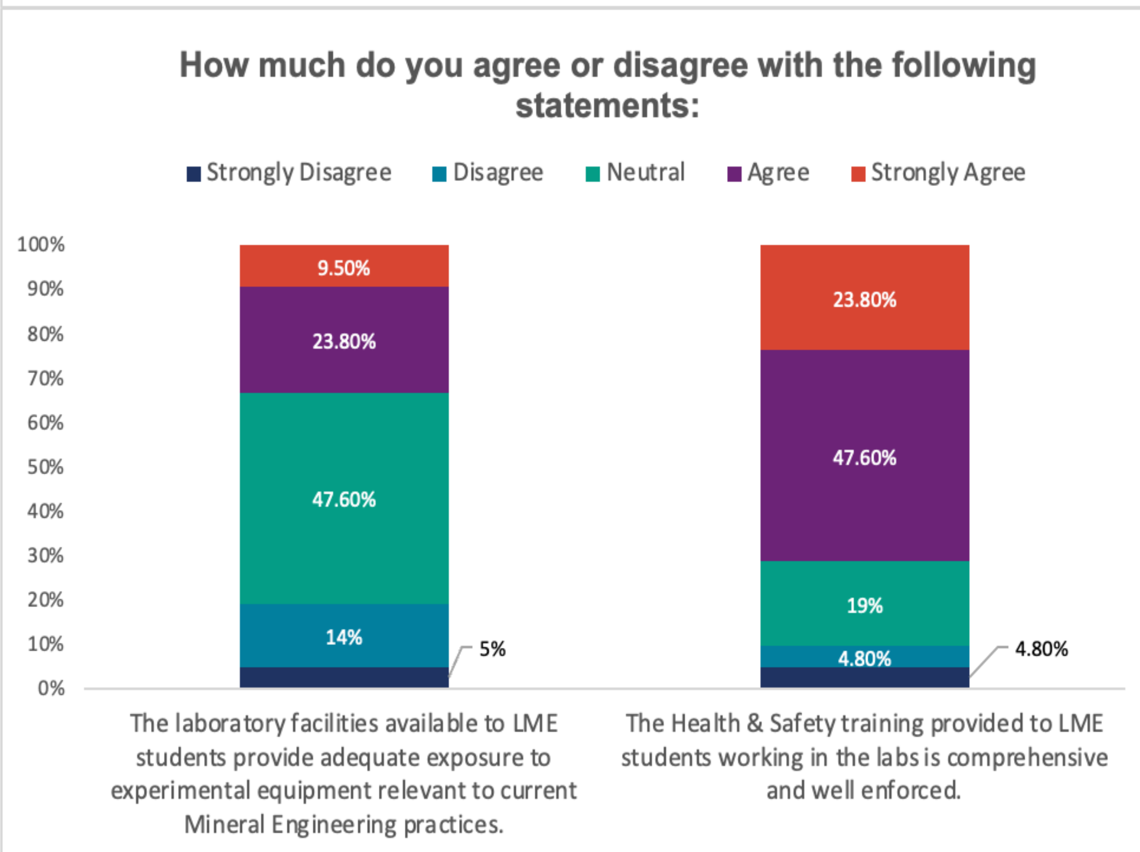
- The courses are great, as it seems to be very relatable to mining. However, sometimes I encounter TA or professors who restrict themselves from helping student's academically.

- Overall, Min courses are taught well, however, CME courses are not as well taught.

- Please let us use Deswik instead of Vulcan! Some first-hand experience with drill core samples would be useful. It really helps understand and visualize the ore (based on my experience in ESS423, an elective) and I think including drill core labs would be helpful for many students. Also, hands-on experience with mining equipment would be incredibly useful, even if just for an afternoon. By this I mean trucks and drill equipment.

LABORATORIES:

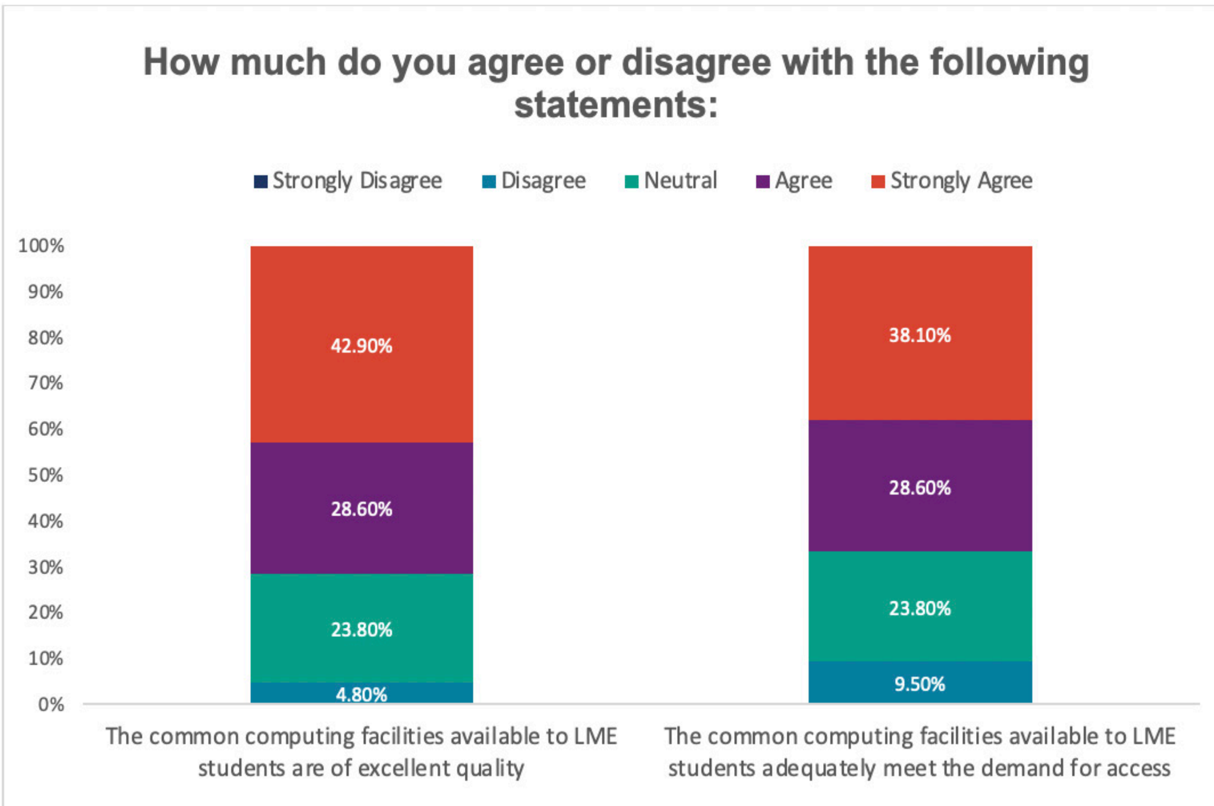




Is there any further comment you would like to make about the department's laboratories?

- Access to the fourth floor must be improved and all students should be granted a blue fob. As things are, it often feels as if I'm being intentionally barred from the program's facilities!
- The size of the lab is sometimes too small so that it's too crowd when working with multiple people.

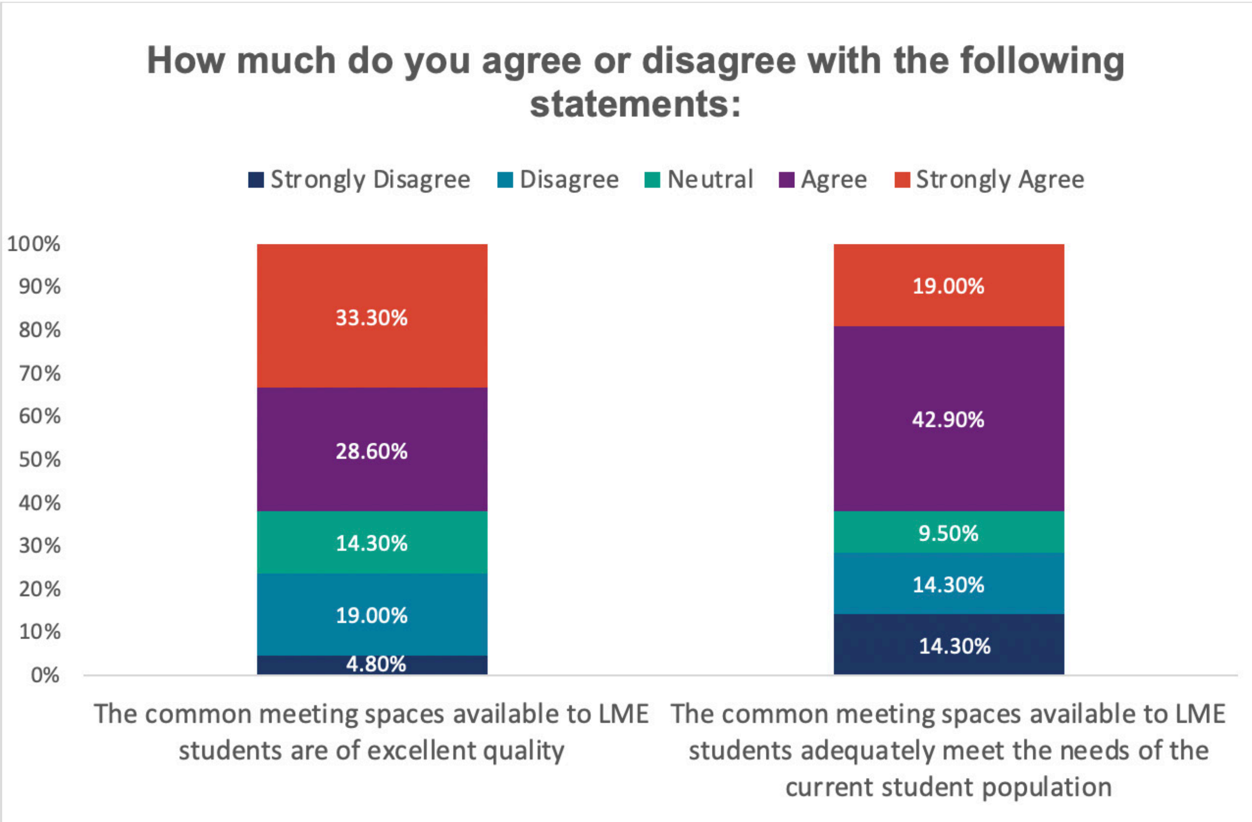
COMPUTING FACILITIES:



Is there any further comment you would like to make about the computing facilities?

- The computer software used is very outdated.
- Same as above, provide fobs to all students!
- Too many non-Mineral Engineering students are given access (fourth floor)
- On the fourth floor of the Mining Building, the majority of the fluorescent lights directly overtop the computers (the ones that are about 1' long and can be turned on/off by students) don't work. They are either defective or burned out. It would be great if these could be repaired such that our workspaces are adequately lit. However, please ensure they remain an OPTION for us to turn on; not always on.
- It would be better if they fix lights attached above the computer seats.
  MB402 is excellent and well liked!
- Some times the computer lab on campus is too noisy.

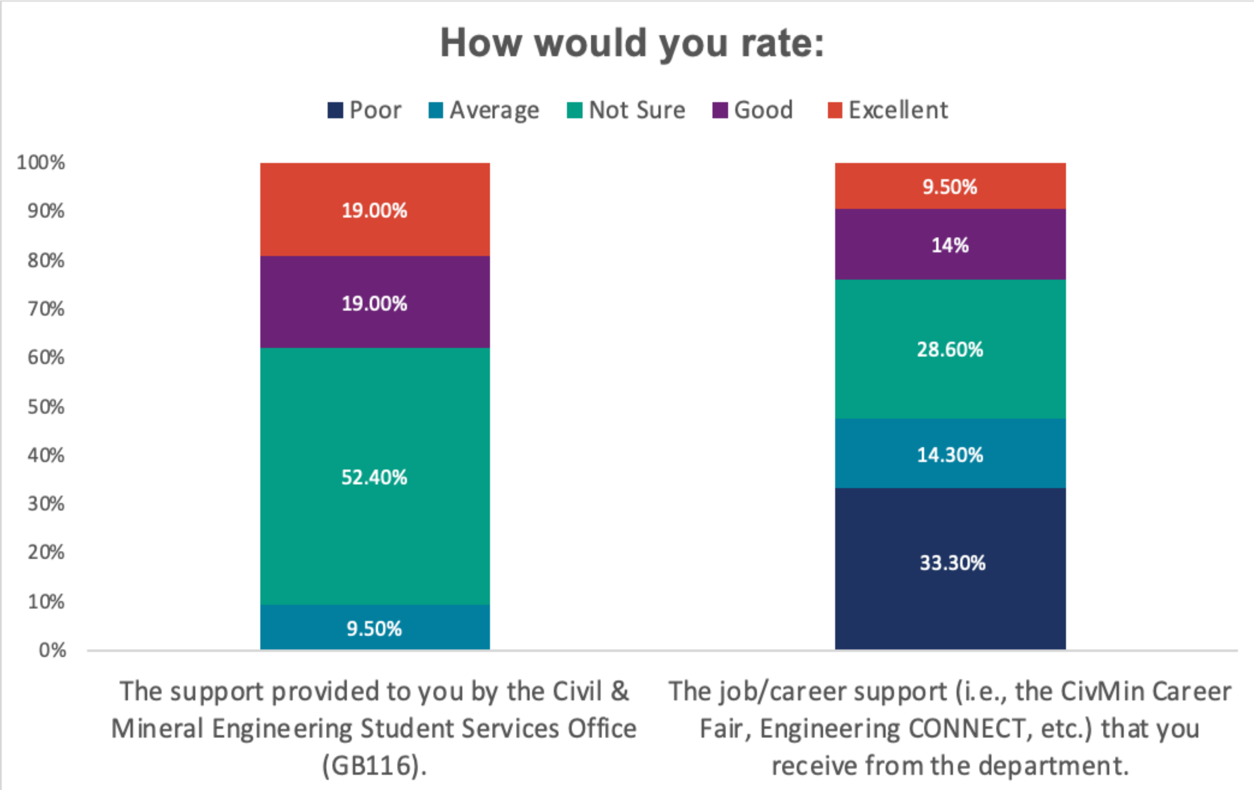
COMMON ROOM/STUDENT CLUB FACILITIES:

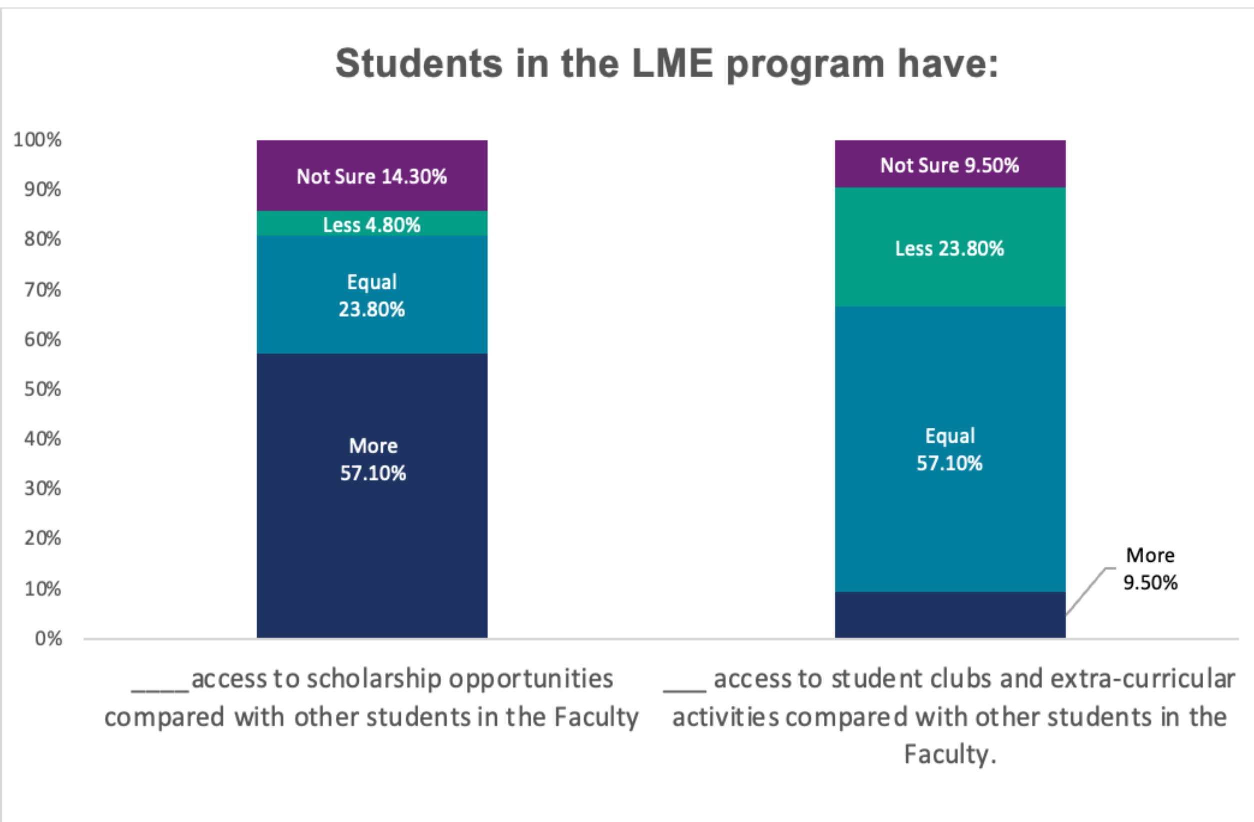


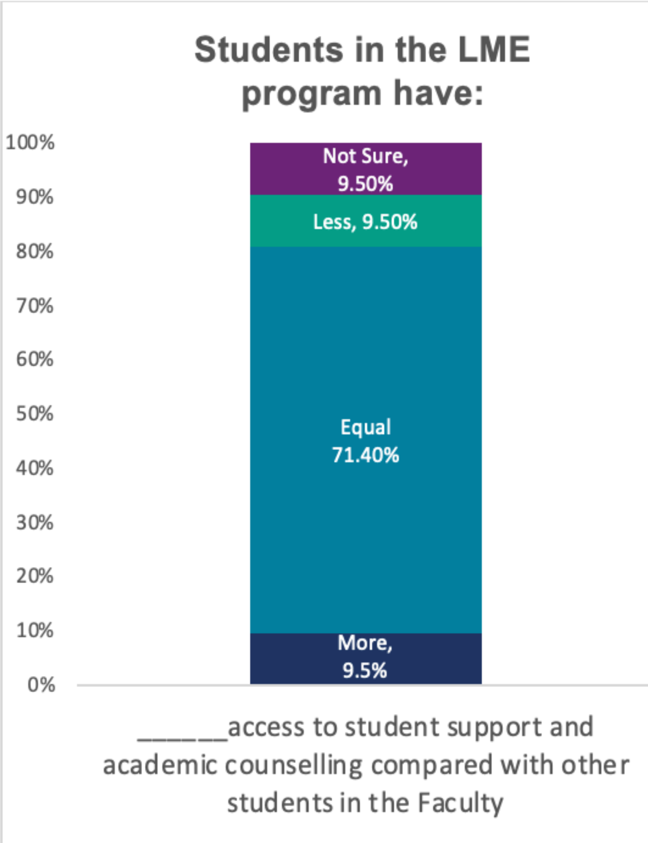
Is there any further comment you would like to make about the common room or student clubs facilities?

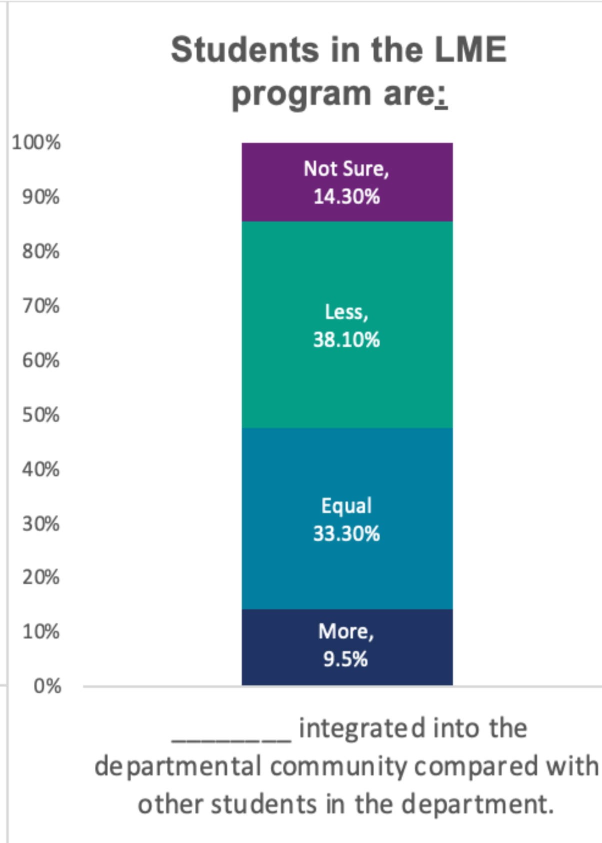
- Access needs to be restricted to LME students and MB126 needs to be better utilised.
- It's fine.
- The [Min Club] common room should be expanded, as at peak times, there is not enough space for everyone. The smaller size seems to deter students from using the room.

STUDENT EXPERIENCE:





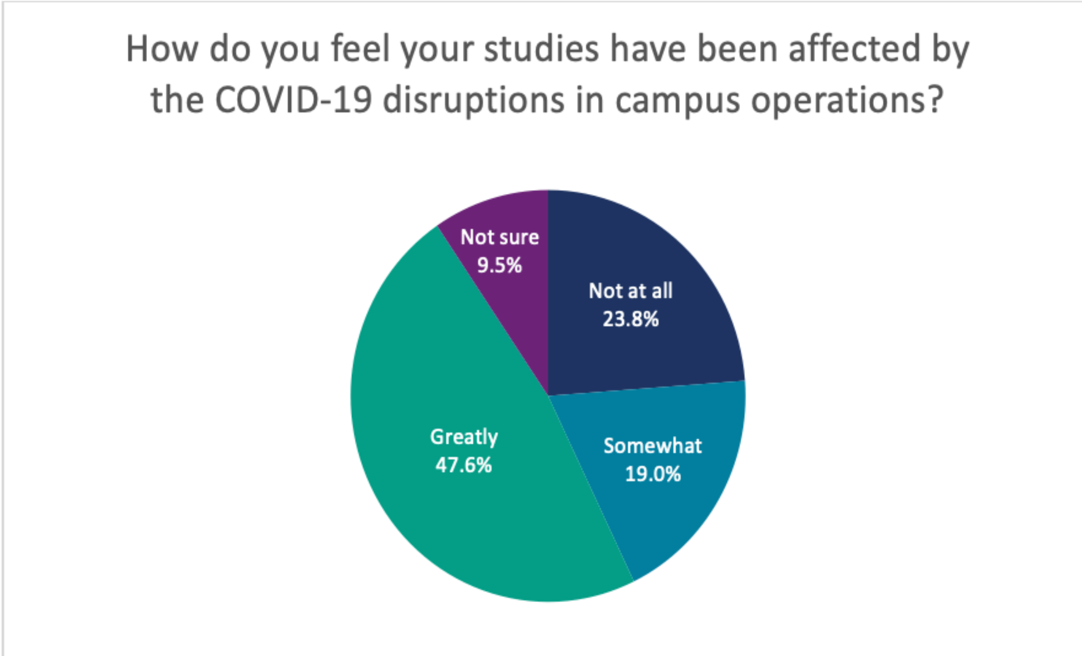




Is there any further comment you would like to make regarding your overall student experience?

- Min [students] are normally an afterthought when it comes to Department affairs. Perhaps due to our small size. But, for example, in our CME courses the focus is mainly on the Civ's, and the courses are mainly taught by Civ professors and Civ TAs.
- Marlyn De Los Reyes in the ECC is a great help!

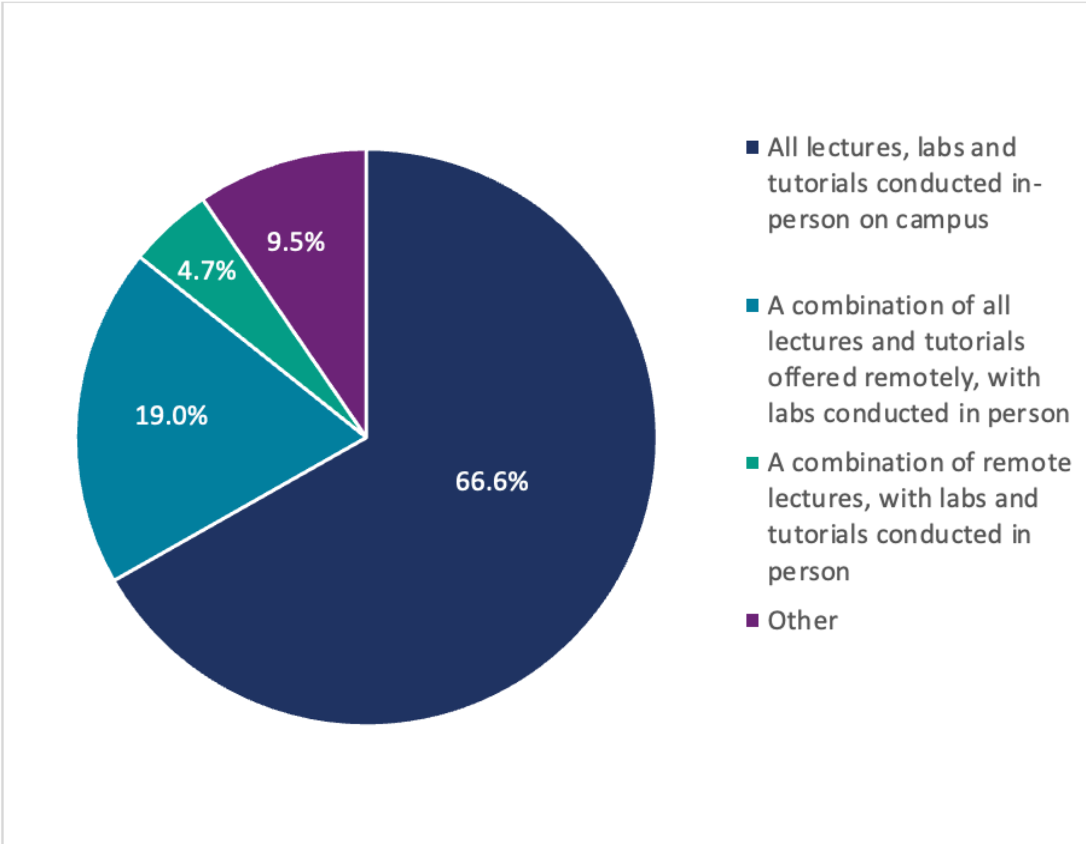
IMPACT of COVID-19 DISRUPTIONS:



If you answered "Somewhat" or "Greatly" to question the above, please comment on how your studies have been affected:

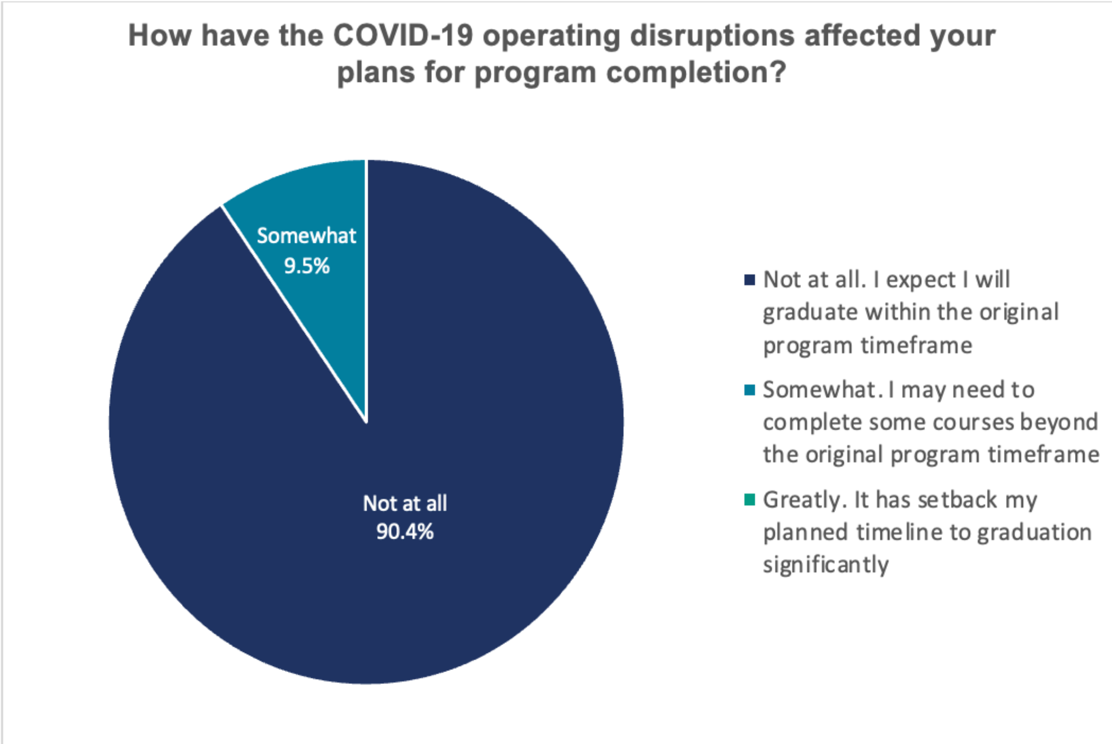
- My studies were somewhat negatively impacted by the pandemic but, all told, U of T and the LME program did well to adapt to such a difficult situation.
- My 1.5 years of online education reshaped how the University structured its courses and evaluations.
- It was hard to learn things online and the time difference did not help.
- Online learning, lack of access to facilities, difficulty meeting people.
- Closure of common areas and enforcement of masks made it almost unbearably difficult for comuter students as they had no place to even eat or relax in between their classes.
- Didn't get proper first-year experience. Lectures didn't flow well in online settings. Some were asynchronous series. It felt like I didn't learn anything from the first year and struggled through second year.
- During the 2020-2021 school year, greatly. Since then, not at all.
- Badly. Online school is fun but it is a magnitude worse learning experience than in person.
- Online learning is hard, and lack of socialization isn't great for mental health.
- Made the transition from high school to university very rough. The online self-driven learning was not very effective. Online learning did not motivate any learning.

Now that campus activities have resumed to normal operations, which approach to learning do you now feel is most beneficial to you in terms of successfully completing your program:



If you answered "other" to the question above, please comment here:

- All lectures, labs, and tutorials conducted in person but with access to lecture recordings.
- Lectures and tutorials offered remotely and in person (recorded lectures), with labs conducted in person
- It is critical that all classes be in person so we can learn properly!



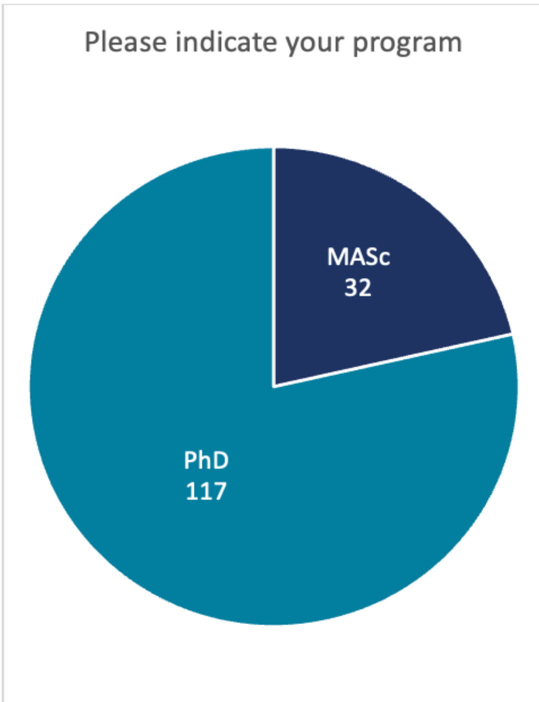
DIRECT STUDENT COMMENTARY

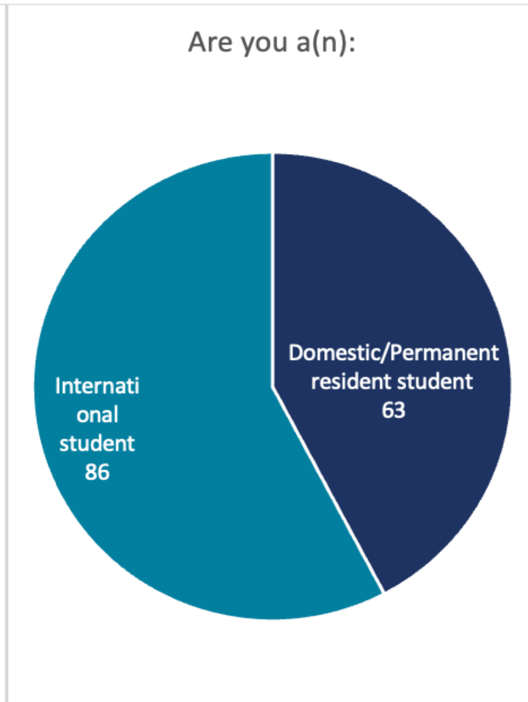
FINAL THOUGHTS OR ANYTHING ELSE THAT WE MISSED?

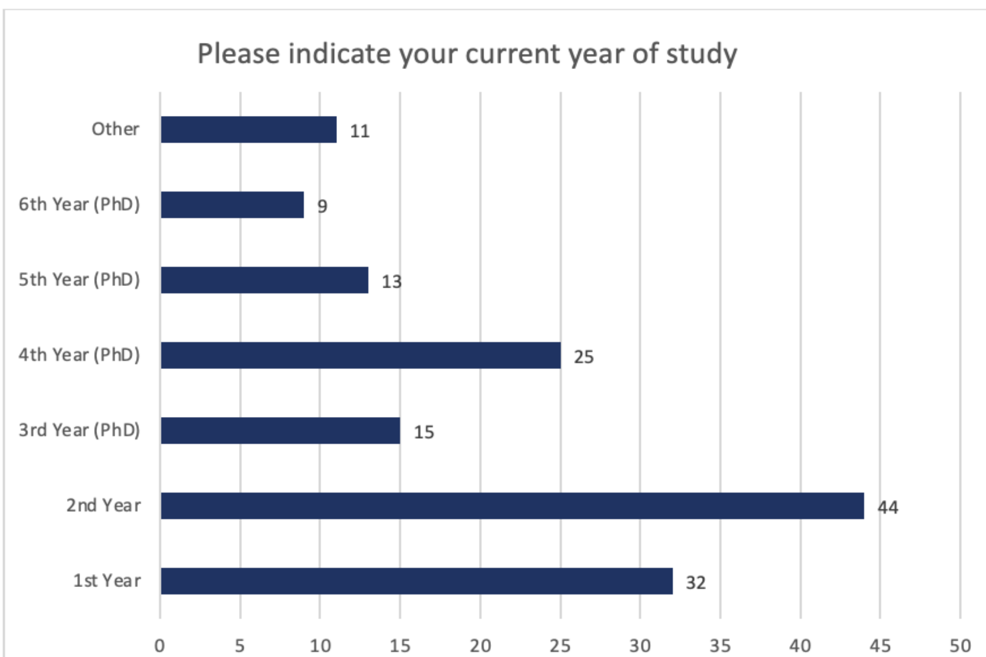
- Please, make the [Min Club] common room, fourth and fifth floors more accessible to students! Also, organizing more mine and site visits over the course of the four-year program is critical! My cohort is two months from graduating and roughly half of our members have never been to a mine! Overall, staff and faculty do an excellent job!
- Overall, the Department/Faculty doesn't consider LME equally, needs more career resources (PEY) and mining-related courses that aren't only technical (financial).
- Need the Department and Faculty to actually care about the Mineral Engineering program and not leave us as an afterthought. Mineral Engineering alumni have [accomplished] great things. Providing current student with more resources and mining-exclusive classes can further help the current students.
- Overall, LME is a great program. No complaints. Thanks.
- Increase acceptance rate into the program.
- Improvement on student exposure to mine sites and improved geology camp accommodations.
- Pretty good program :)
- Please give Mineral Engineering students access to the fourth floor computer lab in the Mining Building, i.e. provide fobs with access to the computer lab.
- So far, it's been good. It feels slightly unstructured as we are typically given assignments quite above our level without any explanation on how to approach them.

DEPARTMENT OF CIVIL & MINERAL ENGINEERING
SELF STUDY 2022-23 - GRADUATE STUDENT SURVEY
MASTER OF APPLIED SCIENCE (MASc), DOCTOR OF PHILOSOPHY (PhD) PROGRAMS

A. ABOUT YOU



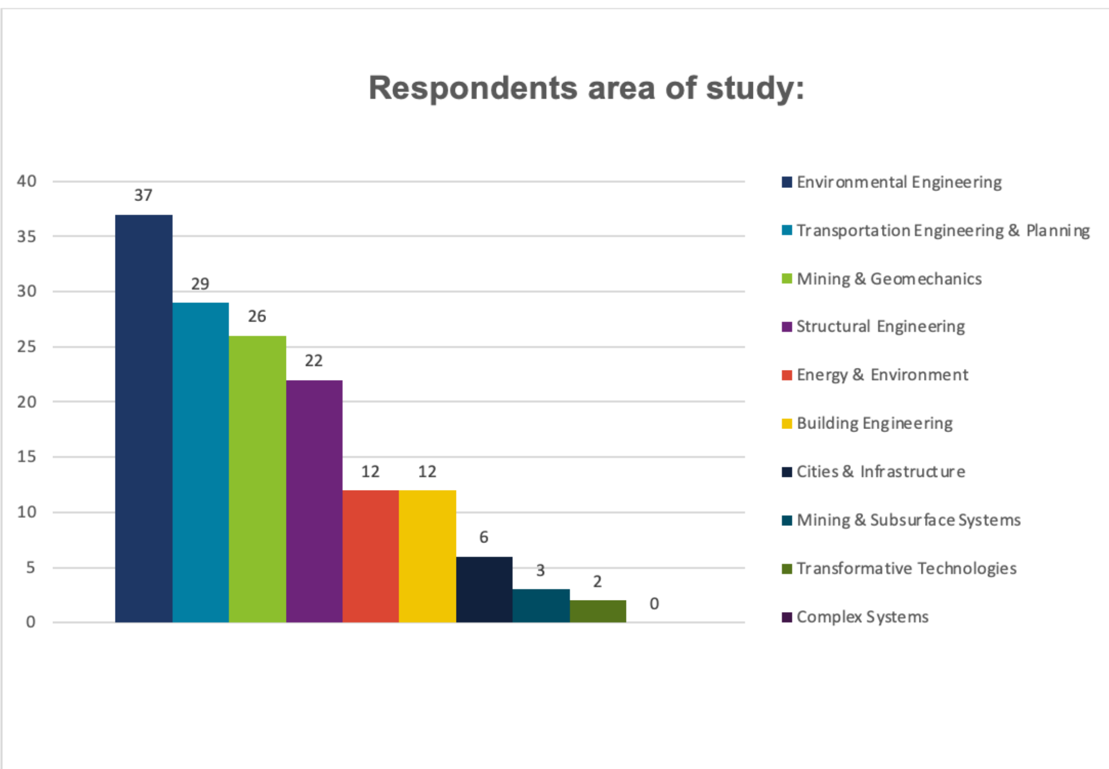




Appendix: A.7 Department of Civil & Mineral Engineering Self-Study 2022 Survey Results Graduate - Doctoral-Stream Programs

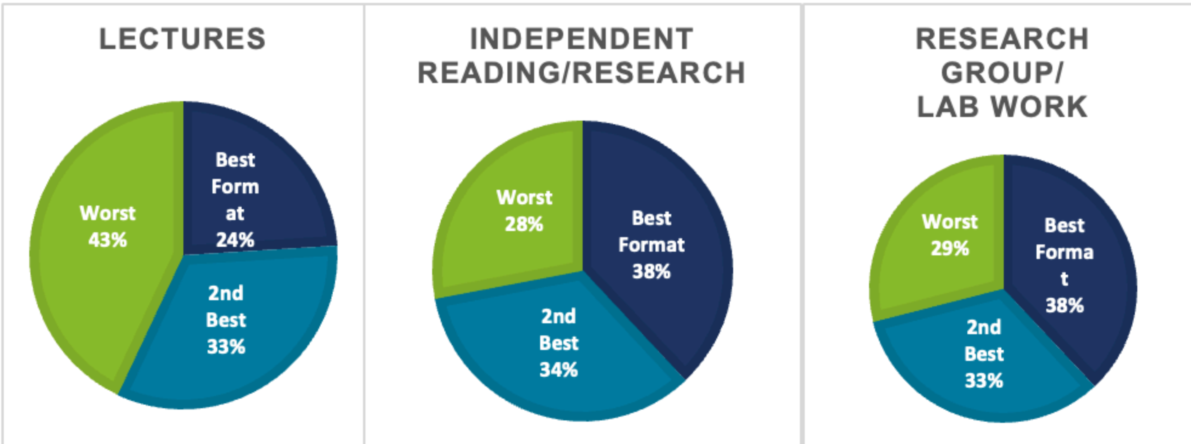
If you chose other, please identify your current year of study below:

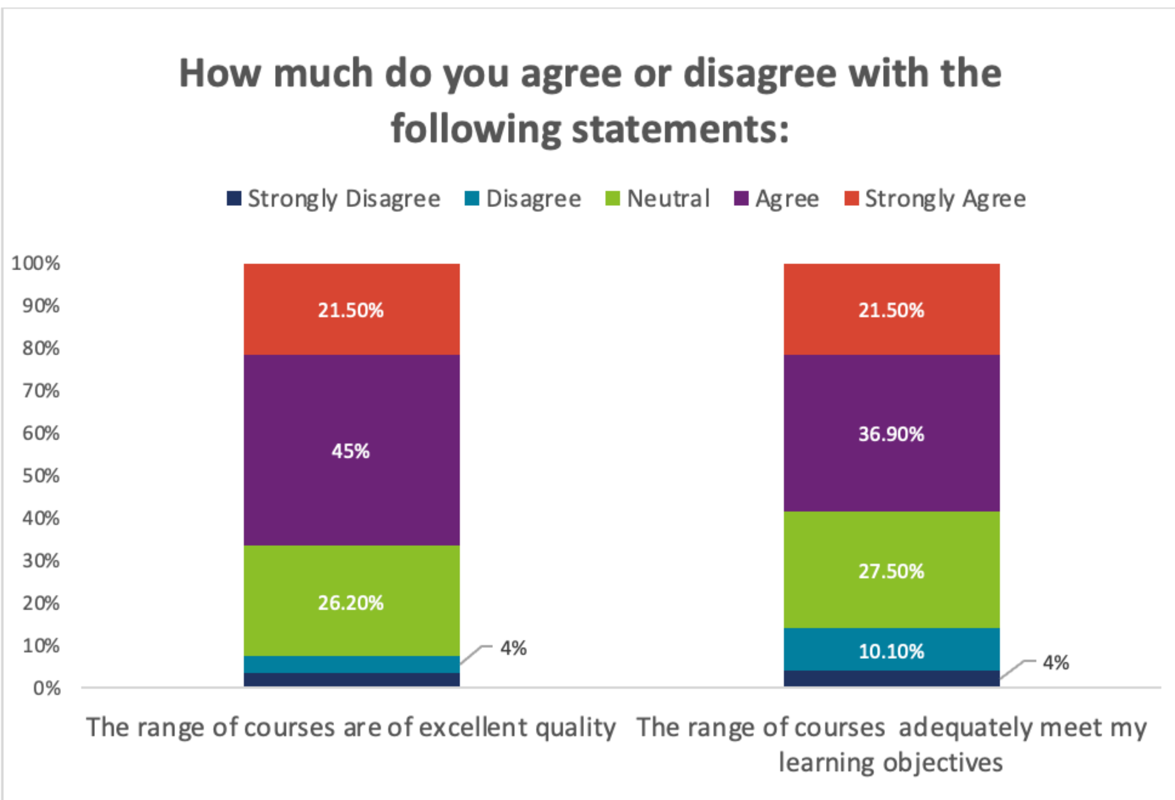
- 4th Year (MASc)
- 7
- 7th Yead PhD
- 3rd year (MASc.)
- 4th year of PhD in combined MASc and PhD
- Note - Combined MASc & PhD program (transfer)
- 8
- 8th
- Started fall 2023 in masters program, transferred to phd summer 2015
- 9
- 7

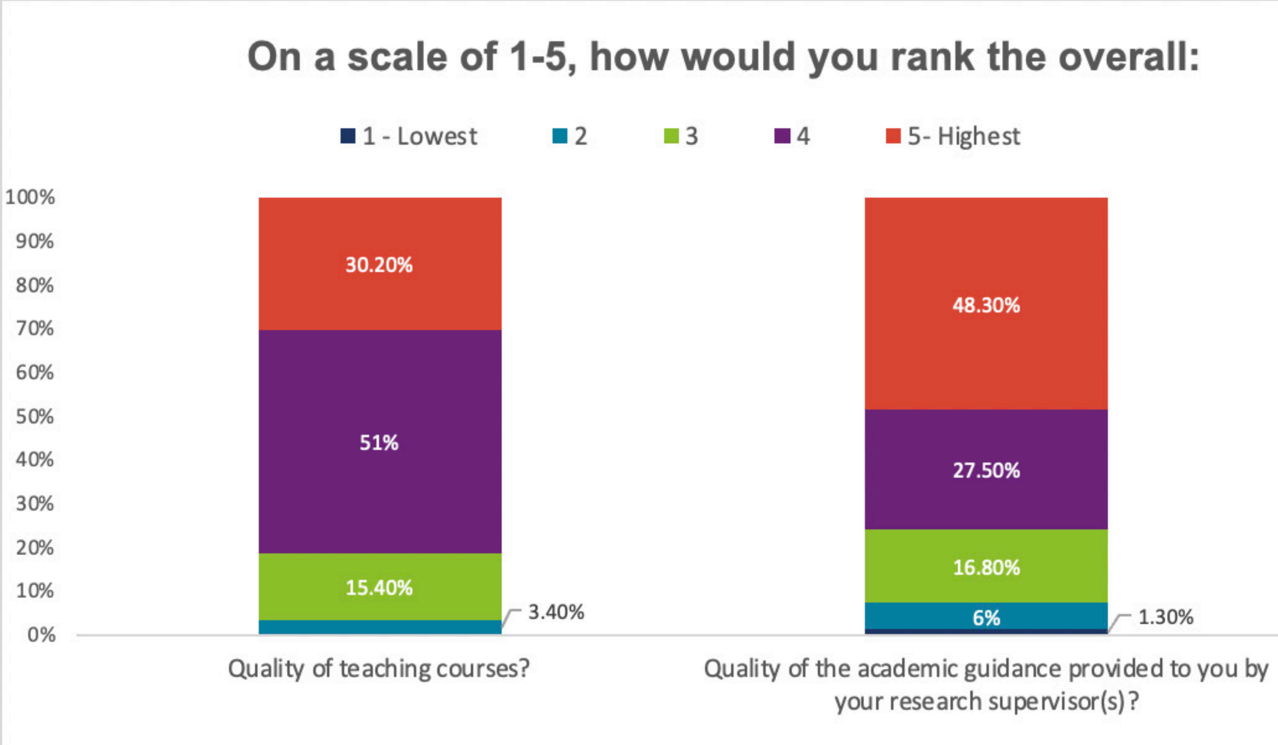


ACADEMIC:

TYPES OF ACADEMIC ACTIVITY FOR LEARNING:

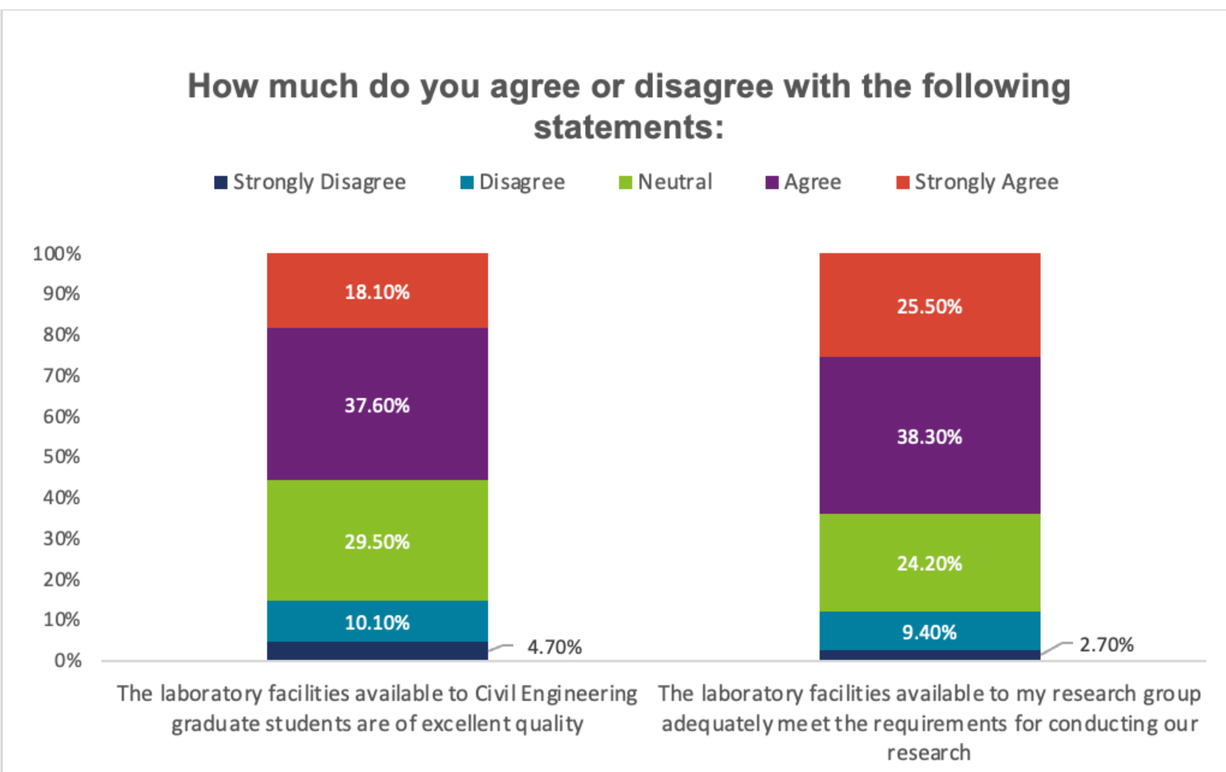




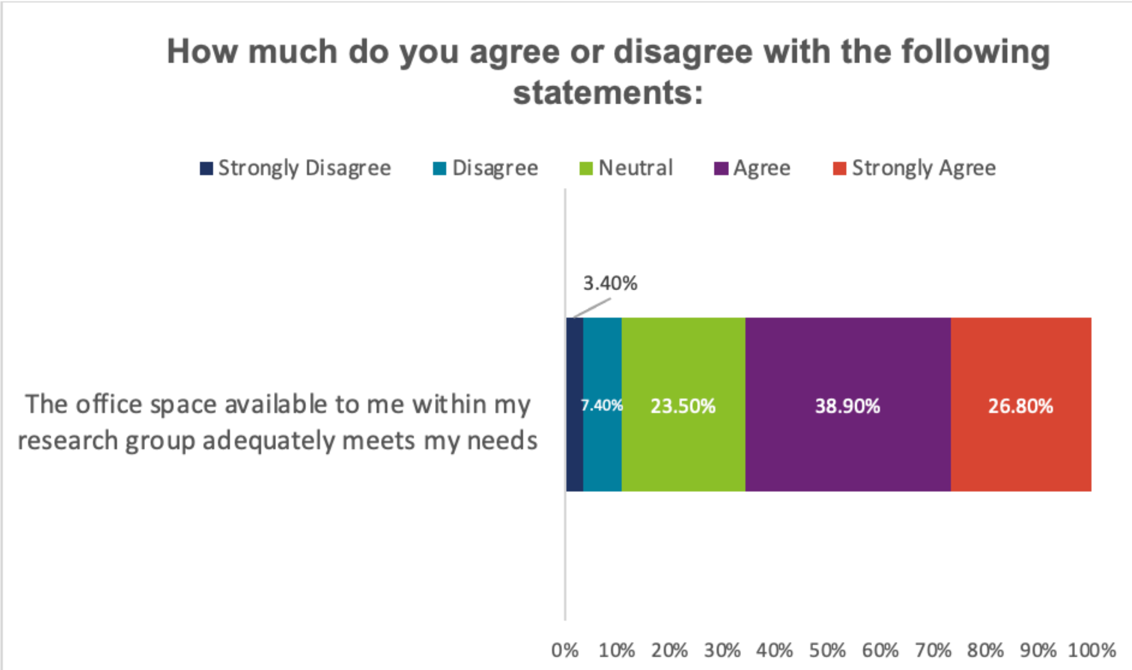


FACILITIES

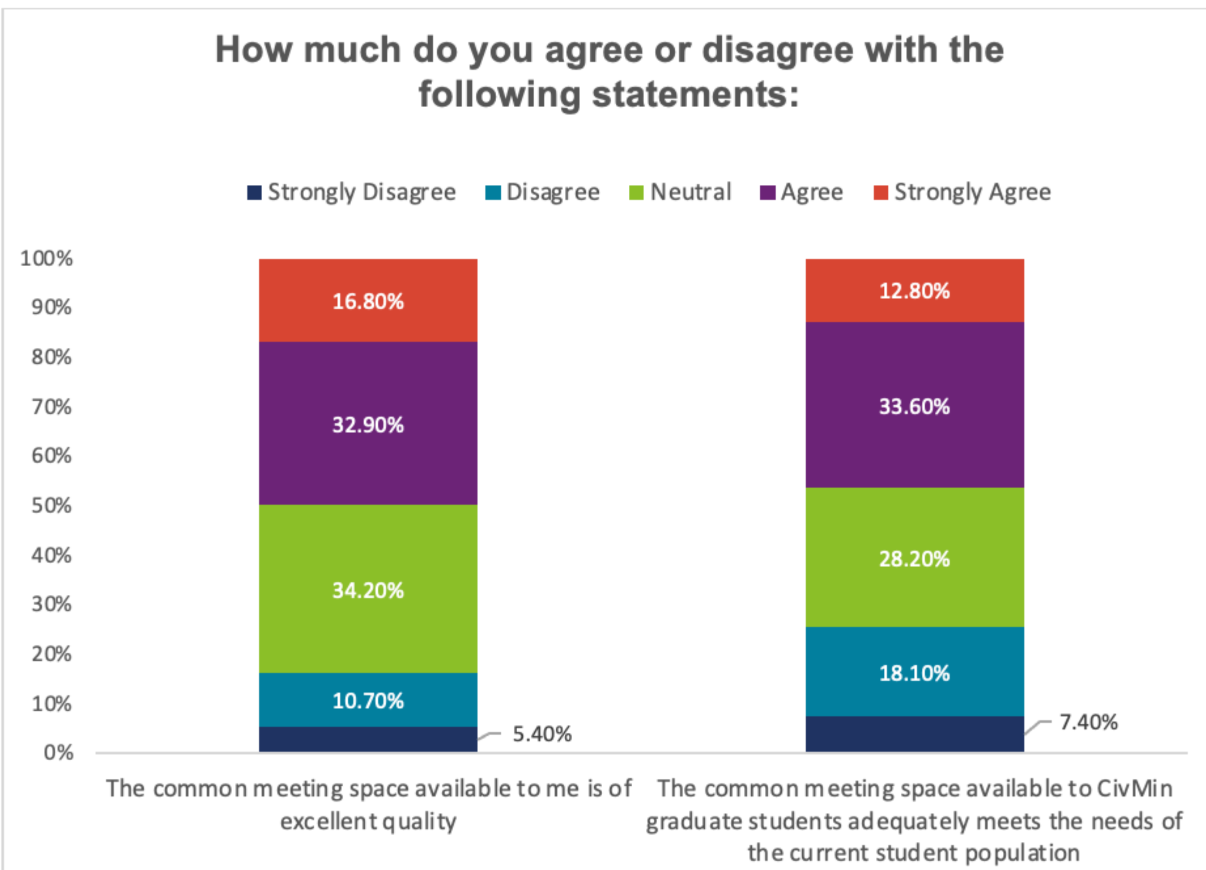
LABORATORIES:



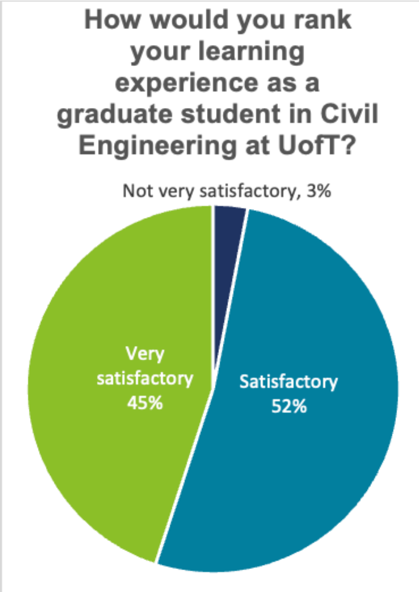
OFFICE SPACE:

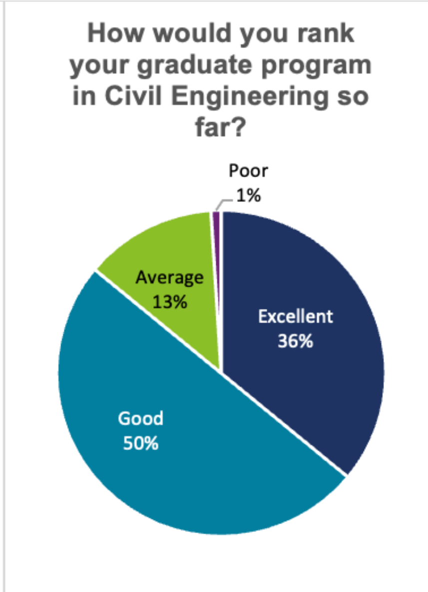


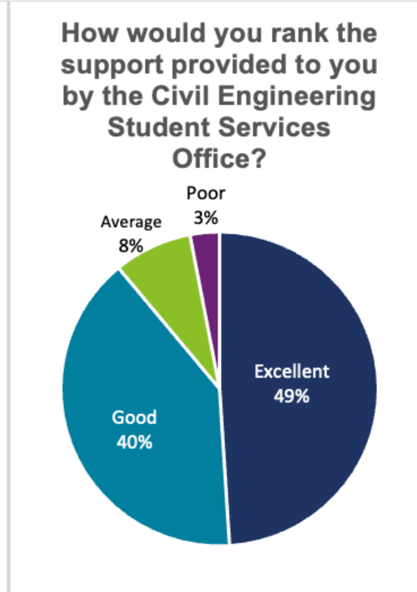
COMMON ROOM/STUDENT CLUB FACILITIES:

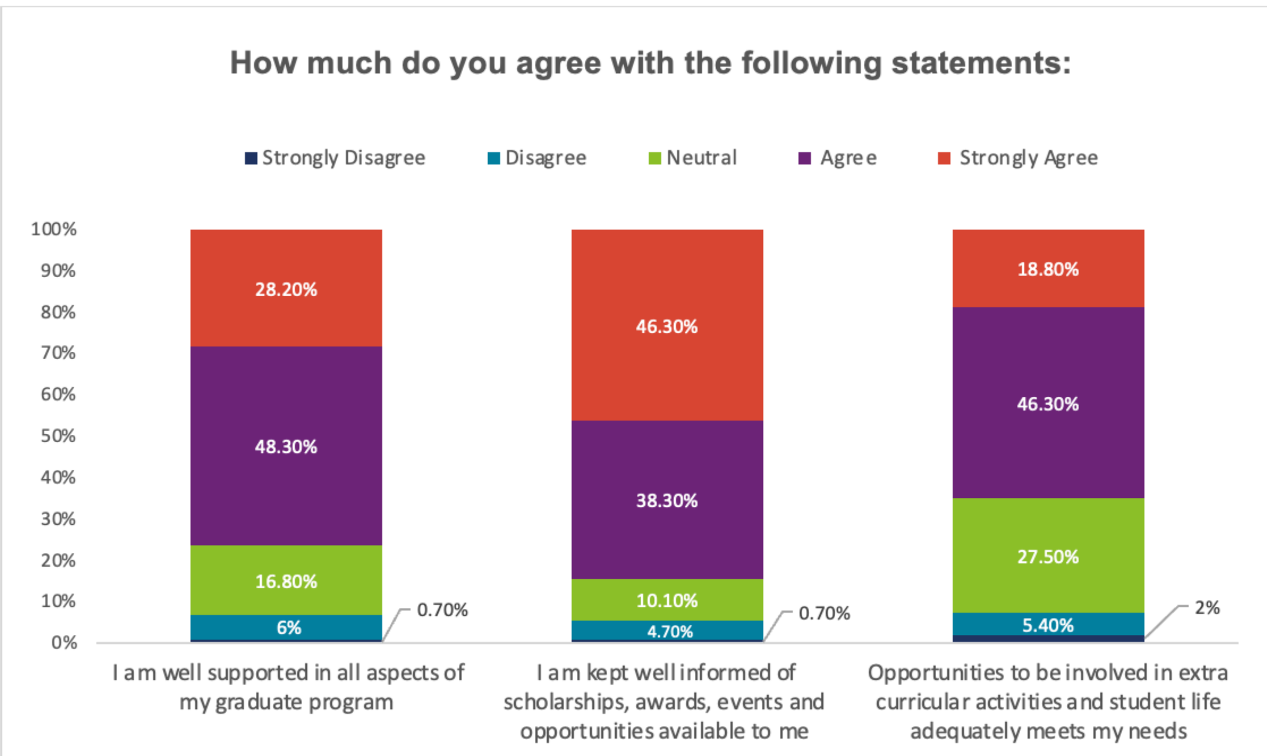


STUDENT EXPERIENCE:

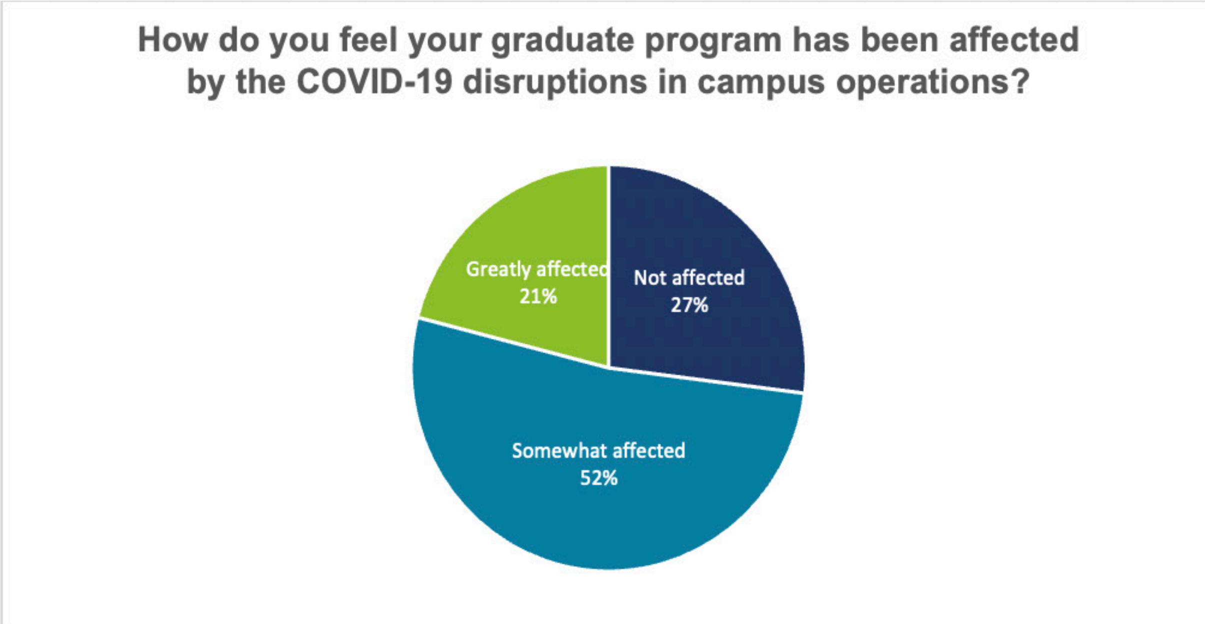


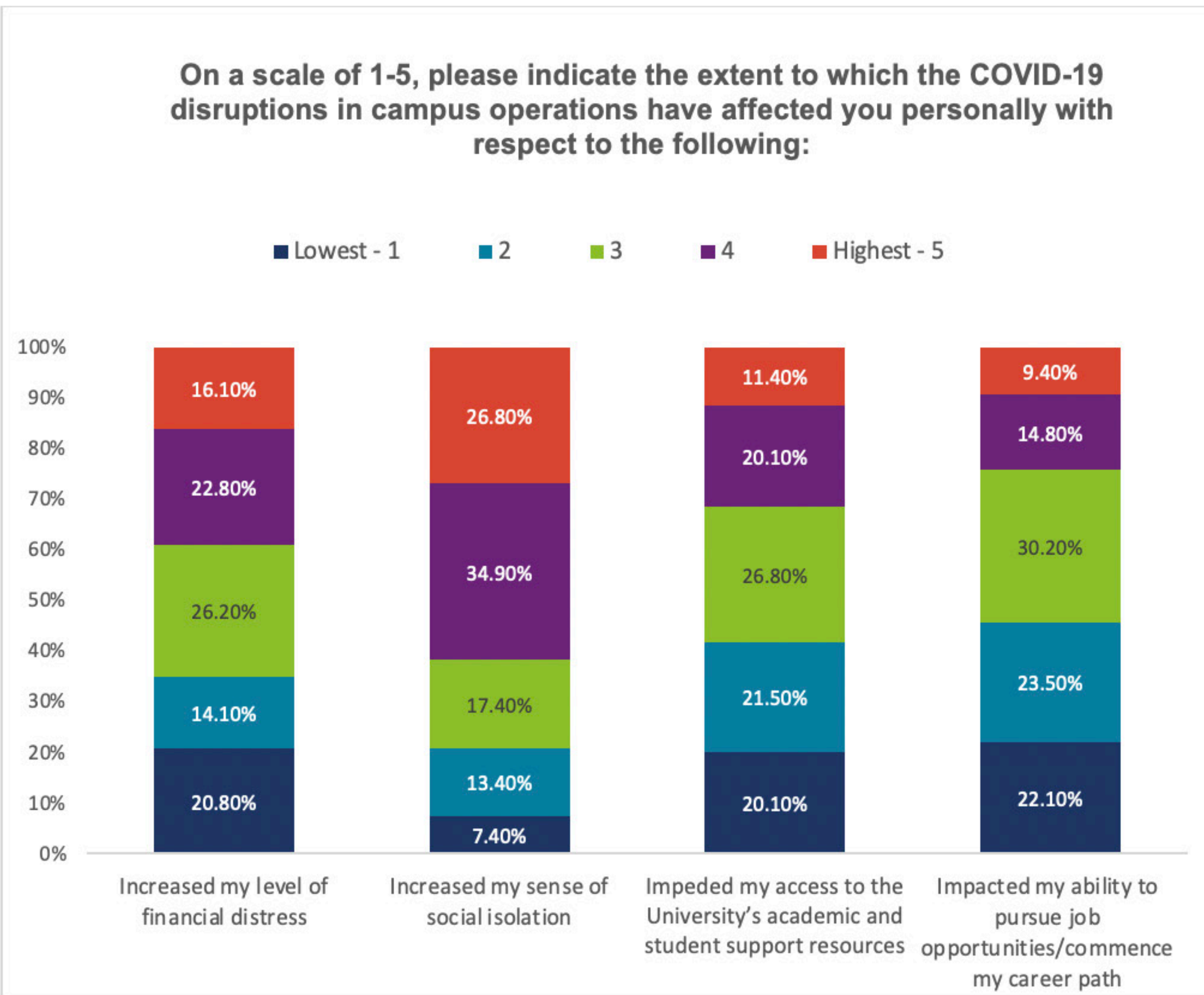


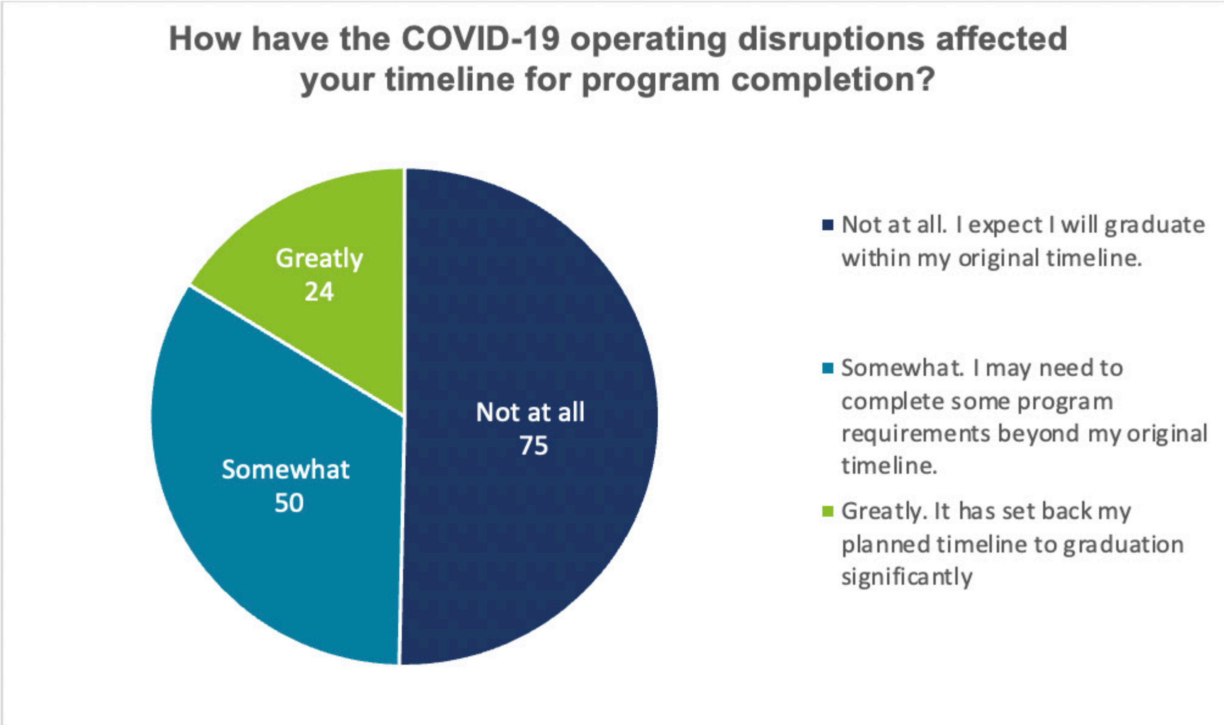




IMPACTS of COVID-19 DISRUPTIONS IN OPERATIONS:







DIRECT STUDENT COMMENTARY

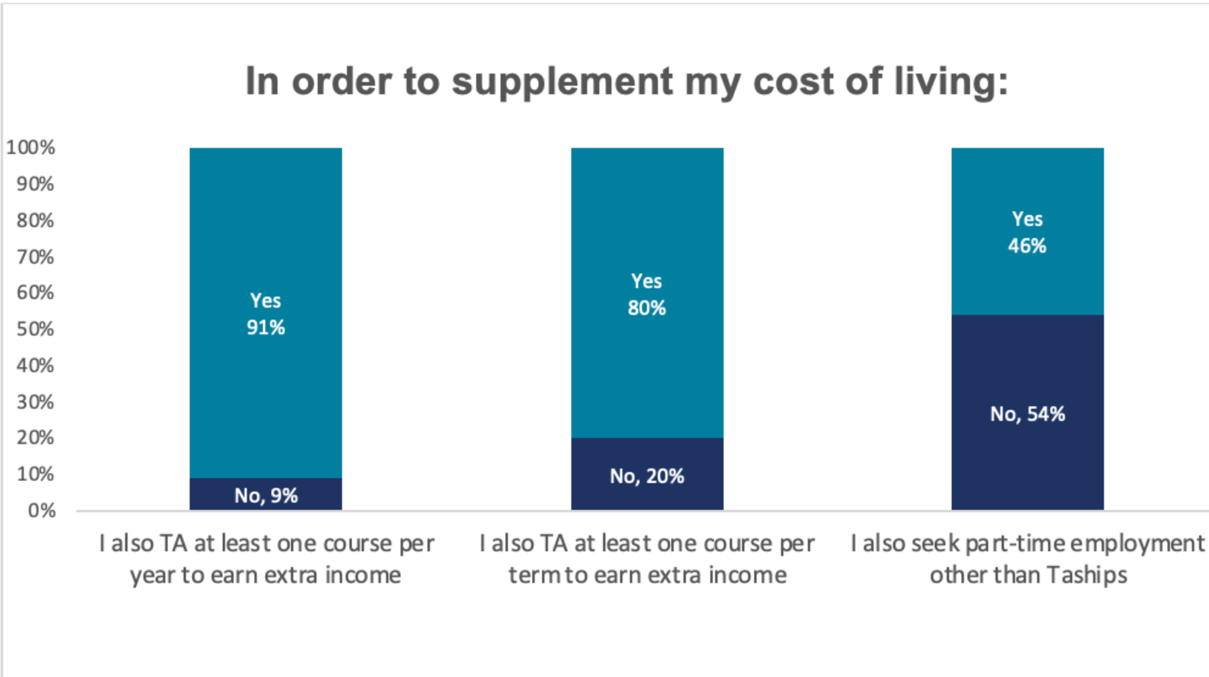
If your answer is B or C above, please comment on how long this has set back your timeline for program completion:

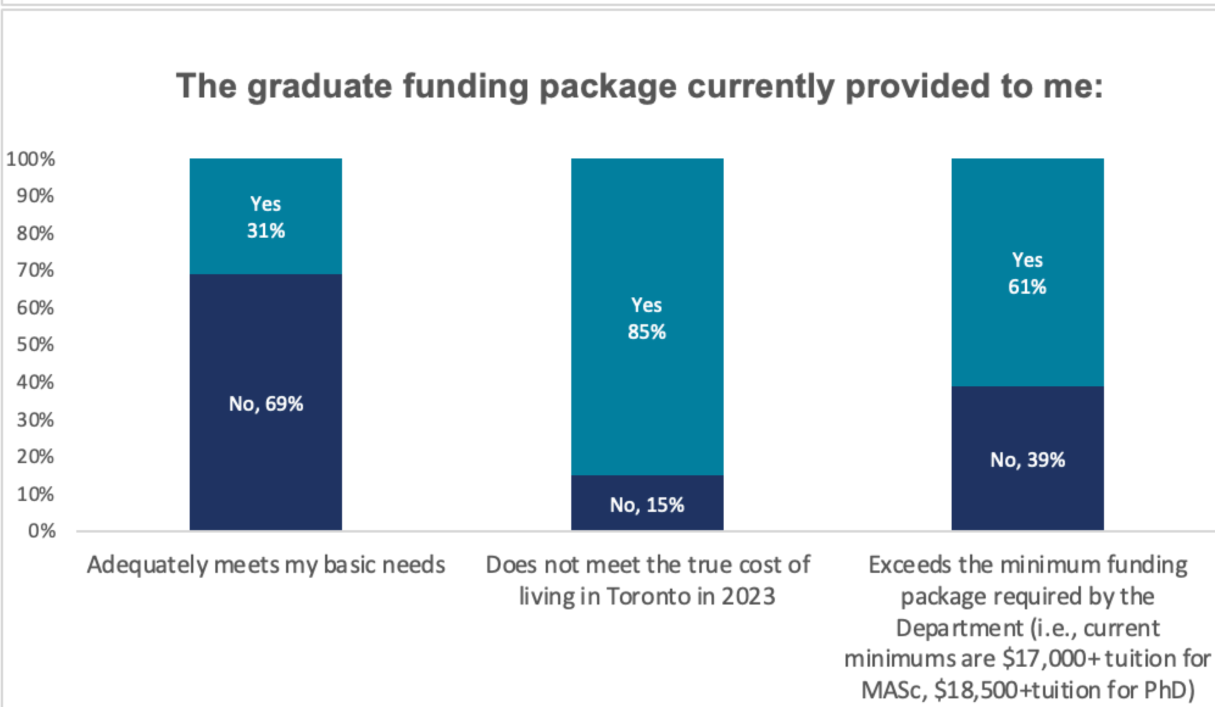
- Half to one year
- About one year disruption in data collection procedure. Not just because of the University, but because of the [lack of] access to companies
- I estimate the effect of the pandemic on my graduate study completion date has been in the order of four months or one term.
- Probably a few months (five to six)
- Disruptions due to COVID-19 have set back my program by at least a year. Disruptions included closure of the lab for extended periods, in addition to not receiving environmental samples critical to my research.
- COVID-19 has affected at least two academic terms for me.
- At least two years
- I think COVID had some impact, but I do not think it is the reason I am graduating late. And I think it will be used as an excuse for why I am graduating late by people who would not want to address the real reason
- Delay of about two years, as very limited access. Even with access it was impossible to conduct tests.

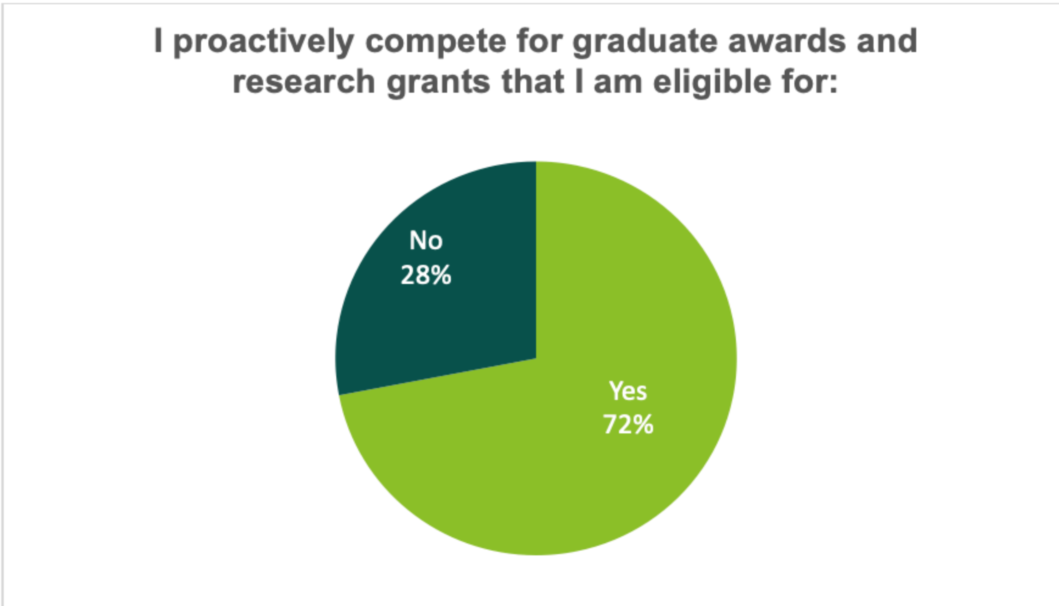
- At least a semester, since lab work was suspended for a period and international shipping was taking longer, which delayed some experiments.
- During my program, I only needed to take one CivMin course (Data Science, which is not your “typical” CivMin course). This course was challenging, but well-suited to the changing needs of the CivMin industry. I have a specific area of research, which is not well represented in courses at CivMin. While I am part of the DWRG, my interests lie in water resource management and the intersection of water with energy, particularly in the Global South and emerging economies. It would be great to have courses in this area, or other courses similar to Sebastian’s which focus looking on data/machine learning and the environment.
- Approximately six months.
- Four months, due to lab closure, as this was a critical time for program progress that could only be achieved in lab.
- At least one year.
- I am not sure how long, but one year or more for sure.
- I put “3” for those but ideally a NA option.
- One year.
- My program started at September 2020, however, most of my experiments began at around October, 2021. This has delayed my research progress.
- It reduced the ability to work with other team members, so I had to do more research on some topics that other members were already working on.
- Set back my graduation due to lab closures (four months) and reduced lab availability for over a year after the lab reopened, due to extremely reduced occupancy limits. It’s hard to estimate the exact time setback due to adding up all the impacts of reduced occupancy on my lab use, my summer students lab use and reduced access to academic/research resources during this year-and-half long period.
- About eight months to one year.
- It is one of the factors which has broken the social cohesion of our lab group.
- Approximately one year.
- Half a year.
- At least two years.
- I will need another year to finish my research.
- By about two years.
- I wish we were placed in the same office as our research group mates, it would be easier to spark conversations and collaborate on projects. I also wish there were more informal social events for grad students to network with other students, researchers, and professors.
- About half year.

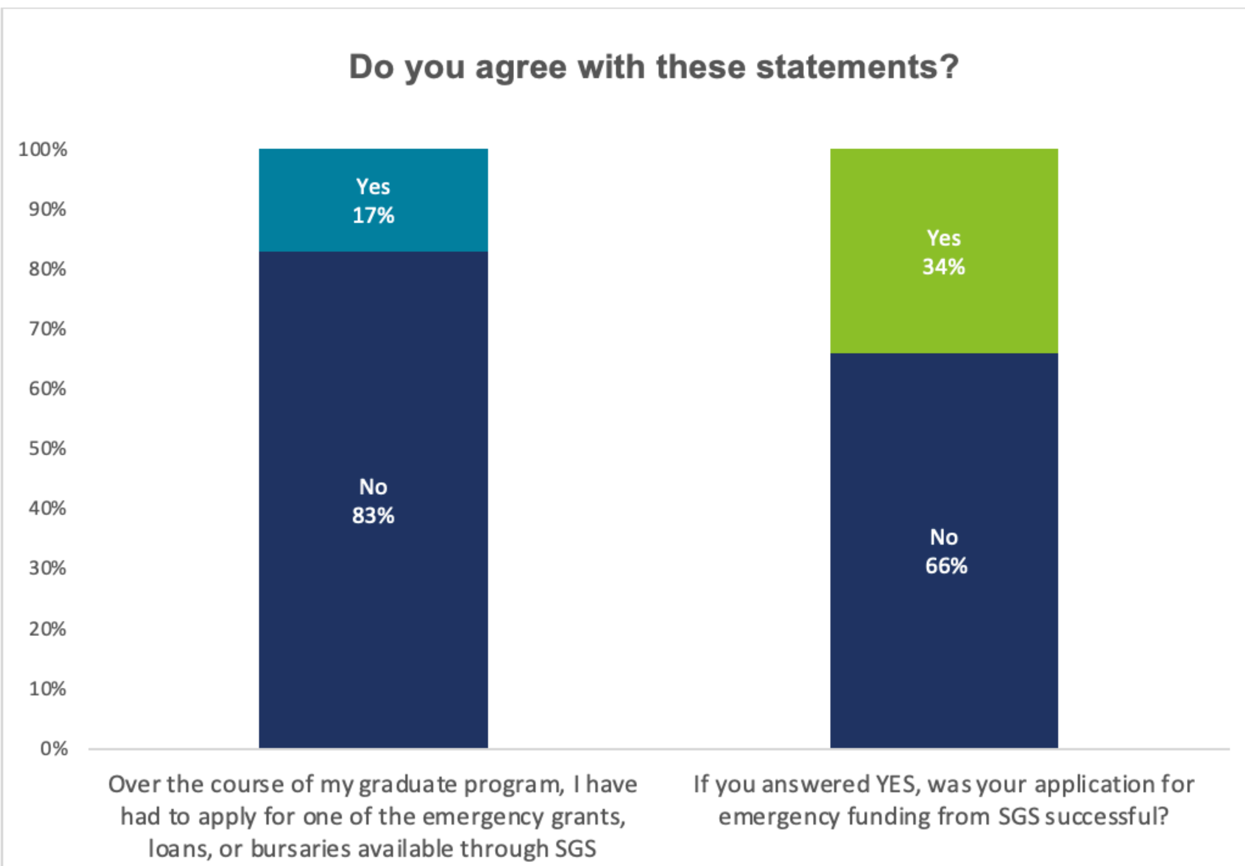
- One to two years.
- The pandemic hit right before the start of my experimental studies, so it affected the fabrication of my specimens as the fabricator had to close, and affected my testing schedule as the GB laboratory also had to close. Then, after the laboratory reopened, we all had to adapt to new guidelines and the backlog created by the lockdown.
- It has set me back by over a year.
- Disruptions have set my timeline back at least one year, possibly more (difficult to quantify).
- The COVID-19 disruptions delayed my timeline by approximately six months.
- About a year. (five to six months original lab shut down plus the time for redoing things due to disruption)
- Four to five months
- My research is based on solving various large-scale and complex problems on the Niagara supercomputer of the SciNet consortium for high-performance computing at the University of Toronto. COVID-19 had a major impact on the technical support and operations.
- One year
- Due to COVID coinciding with pre-existing health issues, COVID and the required safety measures have delayed graduation by at least two years.
- These questions are not applicable for me because I was not here during the COVID
- one year
- The labs where closed for a long time, visa applications where delayed a lot as well.
- COVID-19 closed the testing facility where I was conducting the main experiments/results of my research. The laboratory was not fully operational for about 10 months, and social distancing rules interrupted many operations that required human resources well into 2022. This delayed my graduation and increased the amount of work/labour of my experimental project.
- Perhaps four months.
- Maybe one year.

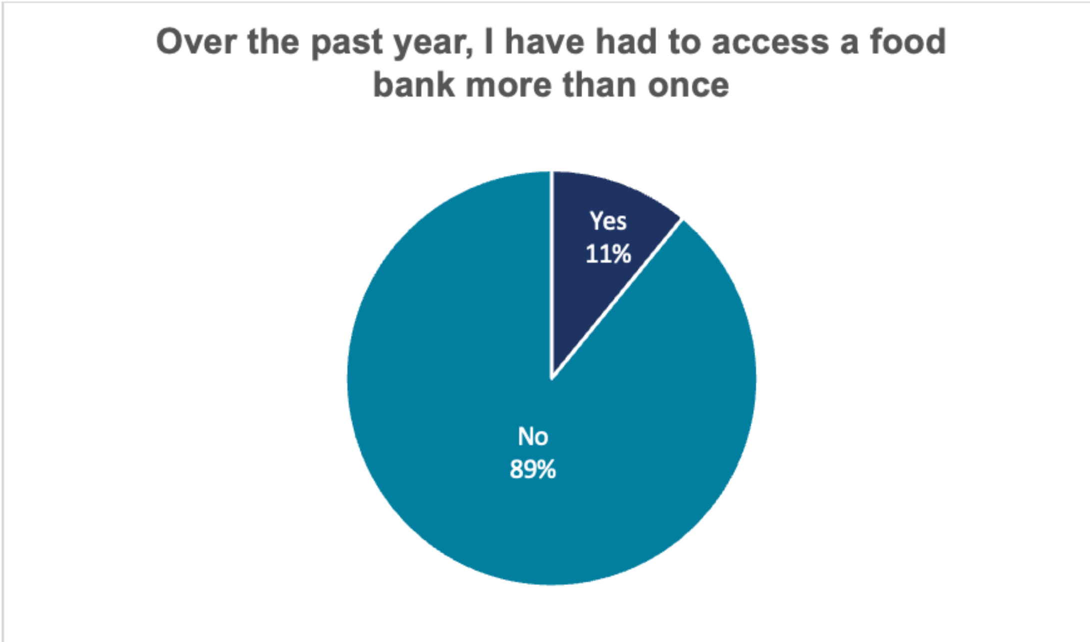
GRADUATE STUDENT FUNDING:






I proactively compete for graduate awards and research grants that I am eligible for:
No 28%
Yes 72%


Do you agree with these statements?
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Yes 17%
No 83%
Yes 34%
No 66%
Over the course of my graduate program, I have had to apply for one of the emergency grants, loans, or bursaries available through SGS
If you answered YES, was your application for emergency funding from SGS successful?



DIRECT STUDENT COMMENTARY

Is there a mechanism or dollar amount that you feel would help to relieve graduate student financial distress, or to bring the level of graduate student funding up to a level that is better aligned with the current the cost of living?

- Minimum funding of $26,000
- Not sure
- At least $20,000
- The current expense of living in a studio apartment near campus is at least $2,300 per month. Plus, the groceries require an extra $700 per month. I would suggest increasing the monthly payment for all graduate students to $2,000 per month.
- an additional $2,500 may help relieve the financial distress due to high inflation
- I am not sure if there is a specific dollar amount but definitely the increase in funding has not matched the increase in cost since COVID started.
- $1,000
- It was really helpful when the Department moved the TAship [sic] outside the funding package. Personally I think adding another $4,000 (approximately the TAship salary) to the funding package would make a bigger difference in terms of relieving student financial distress.
- The Department should increase their minimum stipends for students. If students are going to live in condos in downtown Toronto (about $2,300 per month; $27,600 per year), the minimum stipend cannot even cover the rent. It is not a reasonable amount for PhD students to live. Even though students are going to live in grad houses, the rent would be $14,400 per year, which cannot cover most of their living such as food or clothes.

- CS departments give students about $30,000 per year, except for tuition. And medical schools are also giving a similar amount of stipends to grad students. I personally think the Department should at least increase the minimum stipend up to $28,000 for their basic living.
- Minimum funding of at least $20,000 + tuition. More scholarship opportunities for international students.
- Increase minimum funding in the Department at least to the level offered by other departments (e.g., ChemEng)
- Easing first-year tuition payments for international student: Tuition deadline is too early for a newcomer to save enough money to pay the full tuition by April.
- I think a minimum of $22,000 a year can help future students keep up with the Toronto cost
- A package of $30,000 + tuition will be better aligned with the current cost of living
- I consider the stipend should be similar to a minimum wage salary or at least close to that number
- I think I need at least an extra $300 per month to pay for the increasing cost of rent and food.
- Pay the whole scholarship to the student.
- $18,500 is less than a full-time worker makes with minimum wage in Canada. Given the location of the University (downtown, in one of the areas with the highest rent prices in the country), base funding should at least match minimum wage after tuition costs.
- $18,000 per year is not enough; $24,000 per year would be much better.
- The funding package was already too low before inflation. Now it is almost impossible to live on a PhD salary if you don't have savings or other means of support. Increasing the base salary to at least $24,000 plus tuition would be a reasonable amount taking into consideration rent prices and inflation in grocery stores.
- There may be different mechanisms that can be used to determine minimum dollar amount to relieve graduate students' financial distress. I think the Department can match the minimum funding package on the average price of rent (one bedroom) in Toronto considering a house-secured person spends 3 per cent of net salary on rent.
- $25,000+tuition
- I do not currently live in Toronto and commute as required to campus. My sense from speaking to other graduate student colleagues is that Toronto has become very expensive in terms of living expenses relative to graduate student resources available to each student. Toronto is not alone, as this phenomenon is occurring elsewhere in the GTA.
- I heard from my friends from other departments (e.g., MIE, CS) that they can work more than 54 hours per semester to earn more salary from that.
- An extra $300 per month can relieve the financial distress of having to cut meals.
- Given the current financial climate this is an extremely complex issue, so my only thought is that I don't think funding can stay stagnant. It will have to increase regularly in order to keep up in inflation and increased costs of living.

- The University needs to increase the base funding or provide housing subsidies.
- Based on the average living expenses in Toronto this year, graduate funding shall be at least $3,000 dollars per month
- Bring the funding up to an acceptable level to meet the cost of living in Toronto.
- Increase the TA hours per term.
- Considering the cost of finding safe and suitable accommodation in the city (roughly $1,200/month), funding should be able to cover that without financial distress.
- Everybody's situation is different. This is a hard question to answer.
- Double the $17,000 minimum.
- According to cbc.ca, the average price of one-bedroom apartments is $2,532. A two-bedroom apartment will cost an average of $3,347 per month. Even if I live with a roommate, I'll pay at least $1,750. So, even if the University pays merely the average rent, our packages must start at $21,000. Groceries are not cheap here too. Every time I enter a store and buy just some bread and a selection of fruit, it costs me $200. Everything has become expensive in the past two or three years. My friends in Norway are getting a net income of US$56,000 every year. Why can't our renowned university pay us half of this?! Experts and authorities should really do something about this. AND THEY SHOULD DO IT NOW!
- The cost of living level along with a breakdown of expected costs and funding package amounts over years should be made accessible to students along with funding information.
- Since the rent takes up the majority of the living cost, I think the funding should at least cover the rent according to the market price, with some portion covering groceries.
- $27,000-$28000 tuition
- Making the TA payments as an add-on was a good start, rather than having them embedded within the RA package was a good start.
- Maybe an increase equivalent to the inflation rates the country is experiencing.
- The Faculty can derive the amount of support based on the real world data - how much it costs to live in Toronto. There is an extensive pool of data on the cost of living here.
- According to U of T Student Life, a single person's cost of living (the LOWER end) sums up to around $3,000 per month. The minimum funding should at LEAST cover 80 per cent of that cost ($28,800/year) to get graduate students barely out of the financial stress zone and allow them to focus on their degrees. The remaining 20 per cent can rely on TAships that students should be guaranteed at least once/term.
- The graduate student package is currently at $18,500 for a PhD and this does NOT pay for rent in the City of Toronto. I see a lot of fellow students living in deplorable conditions to make things work. The average rent for a one-bedroom apartment is $2,400 and a two-bedroom apartment is $3,400. Assuming that the student will economize and share an apartment, a reasonable monthly estimate is $3,400/2 = $1,700. Let's add a small amount for buffer - $300/month for internet, hydro, phone, basic food, emergencies.

- $24,000 a year is still very low, but slightly better with the current cost of living. For example, when I was doing my Masters in 2017, I was receiving around $17,000 per year, but the rent for a two-bedroom was $1,500. I paid $750 for rent and this meant I was much more comfortable than I am now. The same buffer in 2023 would mean that an adequate package should be closer to $29,000."

- I think the TAship hours or hourly wage should be updated.

- TA hours: at least 88 hours

- TA min wage: $60-70

- I feel an increase that matches the rate for inflation/rent increase annually would definitely help. The basic funding package for 2019-2021 can almost cover my basic needs. With the inflation and the rent increase (>12 per cent each year for me in 2021-2023), I do feel more financial pressure recently.

- Yes, the inflation is so serious in Canada and we spend more money on basic needs such as food, living and more. As a student, our salary does not meet the Ontario minimum standard because we need to pay the tuition fee. So our students have to do some extra jobs to raise our income, which may greatly impact our studies. If we had sufficient salary, we could concentrate on our research, and not need to feel anxious about financial issues.

- Personally, I spend the greatest portion of my monthly funding for accommodation. Considering recent inflation in everything including groceries, I think $23,000/year is reasonable funding. By getting one TA plus this amount, a graduate student can live without stress.

- $2,000 total per month ($24,000) per year

- A lowest realistic minimum rent for sharing a very small two-bedroom apartment in accessible distance from the University is approximately $1,000 per month, plus a conservative estimate of $50 per month utilities and internet and you are at $12,600 or 68 per cent of the minimum PhD funding package. Many students find they must live closer to the University and/or rent a studio apartment alone, which are significantly more than $1,000/mo.

- Assuming the use of public transport five days a week to and from the University, the most financially sound decision is to purchase the post-secondary TTC pass which is $128.15 per month, or just over $1,500 for the year. Not everyone needs this if they live close to the university, but the closer you live, the more expensive rent is, so the cost would most likely be absorbed into a higher rent.

- Most food cost estimates from government agencies or university programs (University of Guelph, Dalhousie both published reports on these numbers) have the single person grocery bill between $250 to $350 per month in Toronto. Using the bottom of the estimate range means a food cost of $3,600 annually.

- To put this all into perspective, I was earning approximately $17,000 + tuition during my master's degree four years ago at the University of Guelph. I was paying $450 per month in rent and was living a five-minute walk from the school. My monthly grocery bill never topped $250. The cost of living in Toronto is easily TWICE that of Guelph.

- Therefore, the average student is spending in the range of $17,700 of their $18,500 minimum funding package (95.7 per cent) on pretty much the bare minimum necessities to survive in Toronto. This isn't realistic whatsoever though, as this doesn't include clothes, a cellphone plan, external medical costs such as dentistry or vision that are only partially covered by the school health plan, female sanitary products (if needed), laptop/computer to conduct research, or travel to see family or friends. These costs alone extend past the minimum funding and are things I would consider essentially required for good health and operation in a PhD program. Moreover, this doesn't include any leisure whatsoever, and with the stress of completing a PhD it should be expected that the average person needs some way of relaxing or social interaction, like seeing a movie or grabbing a drink, or two, with some friends on occasion to balance their mental health. As it exists, the minimum funding package falls considerably short of this, and with the cost of living skyrocketing recently this thought-experiment is likely vastly underselling real costs.

- Of course most students making it through in Toronto have secured external funding in the form of grants, loans, TAships, or a part-time job, and the lucky few may have also secured a scholarship to ease the financial stress. But if we are discussing the minimum funding package alone in 2023, my best calculation of a number that would provide the baseline support for living in Toronto would be $24,000 per year + tuition. Some might find unique ways of pushing their cost of living lower, like illegally living with three others in a two-bedroom apartment, or staying in the decrepit spare room of a crumbling second-storey apartment over a store in Chinatown, but most will not.

- Really, it should go without saying, that an institution like the University of Toronto (like all other public Canadian universities) should not aim to undercut students living situations to save money. The onus shouldn't lie on the supervisor to provide this extra money either, as they are providing the real value to their student during their degree. The University should absolutely step up their portion of the funding package to meet the cost of living, or higher education will become a prize for the rich and elite rather than the driven and deserving.

- $24,000 per year (i.e. $2,000 per month) plus tuition paid in its entirety in bi-weekly instalments instead of once per month and lump sums three times per year. Payment for all materials, vehicle rentals, flights, hotels, etc. related to research activities should be paid by the Department, or research group, graduate students are part of up front as opposed to being paid by graduate students then reimbursed.

- $25,000

- Rents in Toronto and the GTA in general are extremely high. The funding package should be minimum of $25,000 plus tuition. I do two TA positions a year, I am a part-time tutor with an online tech company, I apply to all possible awards possible, and I am barely making it. It is also harder for us, since we need to travel overseas to see our family, and travel costs have almost doubled after the pandemic.

- Monthly amount should match at least minimum wage.

- Around $40,000 would be sufficient.

- $30,000

- Add $10,000 from the base funding

- Perhaps >$30,000

- Funding should at least cover rent and living expenses.

- Housing available for graduate students, like Grad House, except more of it. Rent is about 120 per cent of the net funding package.

- Match the province's minimum wage, as funded graduate students are committed full-time to the University.

- Increase funding with rate of inflation each year.

- Increase the number of TA positions that we can have in our department. I did not get TA in the previous winter semester, which put me under financial pressure.
- The minimum funding should be increased to around $24,000 per year to better align with the current cost of living. This could be done by automatically assigning TA responsibilities as part of a more generous funding package.
- $1,500 minimum per month (without TA-ing)
- Average rent for a one-bedroom apartment in Toronto is at least $1,000/month. A stipend of at least $30,000 per year is needed to ensure equitable access to students from different socioeconomic backgrounds
- Having a rule for supervisors to have an annual contract with industry partners to help fund students would be a big help. The cost of living (rent, food) is drastically increasing in Toronto, and basic funding is not sufficient at all. This matter pushes graduate students to rent a place with multiple roommates. Living with someone with a totally different schedule and plan affects the studying condition at home. These conflicts are nerve-exhausting and PhD life has no capacity for these issues. The rent of a one-bedroom / no-bedroom apartments are significantly more than what is paid to PhD students.
- I believe that the minimum funding package should equal the Ontario minimum wage of $15.50 per hour, assuming every graduate student works eight hours daily, five days a week (most likely this being an underestimation of the amount of work we actually do). Totaling around $29,760 per year. This will offer the grad students the opportunity to have a decent life in Toronto, as well as allow them to enjoy much needed off-campus activities to avoid stress, anxiety, and depression during our research program.
- Minimum wage above tuition coverage. (~$30,000+$8000 for tuition)
- As an international student, my U of T fellowship only covers half of my tuition so I have to cover the other half with my stipend. If U of T is going to continue to advertise that the tuition is covered, the fellowship should cover all of the tuition, so no payment from our stipend (monthly income for living expenses) is required.
- To cover the essential cost of living in Toronto, one person will require at least $2,000 per month (about $1,500 for housing, and $500 for groceries). To have a better quality of life would require $2,500 to $3,000 per month.
- I believe we need better finical support from the Department. For example, I have a family, so I cannot live in a shared apartment. The only way to afford an apartment is to live in U of T family housing, which I have a lot of comments and concerns about.
- I would calculate it based on the cost of rent (i.e., it costs $1,200 per month for a regular single room in Grad House with several flatmates and it is very difficult to find cheaper rent downtown than this currently). $1,200 per month for a year is $14,400 plus utilities and internet, food and transportation. The current minimum funding isn’t enough to cover these basic needs. Using a 30 per cent rule on rent, you would need an income of $48,000 to cover this level of rent.
- I think additional $500 is necessary.
- It should be increased to $24,000 plus tuition at least.
- An additional $5,000 a year to the base funding package.
- I am probably guessing here.

- 1. I think we are paying students about $9 per hour, but can we aim for minimum wage or close to minimum wage? I think there is a reason why it is called “”minimum wage””. This is particularly important for PhD students who are spending five years of their life at U of T.

  2. I understand that this is not a full-time job, but you can probably compensate with some sort of additional services/duties in the Department.

- The living wage in Toronto is $22.08 per hour, which is $2,867 per month or just over $42,900 per year.

- $36,000 per year.

- According to Statistics Canada, the Market Basket Measure (MBM) represents the cost of a specific basket of goods and services representing a modest, basic standard of living. In 2020, the MBM in Toronto was approximately $24,000. Due to inflation, I expect the MBM to have increased since then. If a PhD student is only receiving the minimum funding package ($18,500), the student would need to be a TA in both the fall and winter terms (receiving $2,500 per term) to barely achieve the MBM in 2020. Students pursuing a MASc would also need to be a TA during the summer or seek external part-time employment. I believe the minimum funding package plus TA income during the fall and winter should be equal to the MBM to ensure all students are reasonably able to achieve a modest, basic standard of living.

- Housing is the biggest cost. U of T should provide more economical options for housing.

- $30,000 per year.

- Partner with grocery stores, restaurants, pharmacies, etc. to provide discounts for U of T students; Negotiate more affordable student passes for the TTC .

- The minimum funding package has to be at least $25,000 per year, not including the TAships.

- The cost of housing is so high in Toronto. Places like family housing can help students to save money.

- I think increasing the minimum graduate funding package will help (around $20,000 plus tuition).

- Support students who have children with daycare funding.

- It is very challenging, especially for families. I would recommend the U of T SGS check the average cost of living in downtown Toronto yearly and try to get the minimum funding near this average. The isn’t a certain amount because everything is changing every year. However, the current funding is really not good. It makes the student distressed financially while trying to find other sources of additional income.

- $3,000 per month.

- I think $25,000 should be the minimum funding package. This will allow students to live with less panic and stress around money, allowing them to focus on research.

- I wish tuition was deducted from our income before receiving it, so we didn’t have to pay huge lump sums. It’s hard to save this money when the cost of living is so high, and it feels more painful when I have to make the transfer. I am able to live without financial hardship right now, because I have secured family housing. Before it was impossible to save any money and pay for housing. The cost of housing is INSANE right now, I don’t know how new students moving to the city will be able to afford the program without taking on debt. I think the University either needs to provide housing, or pay students a base rate that matches the cost of a bachelor unit in the city plus $1,000 per mohth for food, transport, and other basic expenses.

- If at least $500 extra per month is provided, life would be easier.
- $40,000 per year plus tuition
- Minimum of $25,000 annually for MASc and $30,000 for PhD students would make sense in the current economy
- I am not sure about the specific amount of financial support that would help, but current rental fees take a large portiion of the scholarship. It would be good if there could be some financial support to help students due to the increasing rate of inflation. The cost of living will increase every year, but the scholarship amount doesn't seem to increase.
- Annual student funding adjustment based on downtown Toronto's average living costs and the latest inflation rate.
- $2,000 each month would be a better
- At least $30,000 per year salary for each graduate student
- I am currently satisfied with my student funding.
- My sincere thanks go out to you for asking this question. As far as I am concerned, the answer is yes. It is possible to alleviate financial distress among graduate students and increase graduate funding in several ways:
  1. Providing full or partial exemptions to graduate students from tuition fees

  2. Enhancing the basic funding package to include additional allowances for married students

  3. Increasing TA wages from about $48 an hour to a higher amount or increasing TAship hours (since in most cases the actual working hours are higher than the assigned hours)

  4. Increasing the basic fund package from $18,500 plus tuition fee to about $25,000 plus tuition fee (similar to what is done in other departments such as Medicine, where the basic fund package is a higher amount)

  5. Increasing the University of Toronto Fellowship base funding from $3,277 to a higher amount
- With current rental costs of Toronto homes, and inflation increasing, the base graduate student funding should be increased to about $25,000.
- Increase graduate funding such that it provides students with adequate income to afford current housing and living costs based on a third-party assessment, but also increase sufficiently with any increases in costs due to changes in the economy.
- I think that graduate funding packages should be tied to the cost of housing. Based on the minimum funding package, housing options that stay within budget are very limited.
- Flexible funding amounts.
- (rent $1,500 plus food $600) x 12 months = $25,200 plus tuition fee.
- No ideas at the moment.
- Considering that living near the campus is very costly, maybe it would be good that the minimum rent payment for the neighborhood located near the campus is considered in the funding package. For

instance, reimbursement of the tuition fees could increase the total to $25,000, which could be close to survival minimum in Toronto.

- The graduate funding package does not cover my annual rent, let alone food, transportation, etc. Even if I paid the lowest rent that I've heard of among my friends (to live in proximity to campus, which is needed to check in on experiments throughout the day or every day), that's about $1,400 per month for a basement studio apartment, which would be $16,800 annually, which is approximately the base funding package for MASc students. This means that they can afford rent, but cannot afford food, transportation, medication, or activities based on their research funding. Personally, I can afford rent, food, transportation, clothes, activities, etc. because of savings from when I worked full-time, not because of my research funding.

- The funding was not adequate before the inflation in prices. Now with the hikes of living costs in Toronto, I would recommend at least a $5,000 increase per year to relieve graduate student financial distress.

- There might be a few options:

- Post links to part-time on-campus jobs on the department website.

- Introduce paid summer fellowships that count as extracurricular activities.

- Introduce part-time freelance work to graduate students.

- Hold training sessions to help students do part-time freelance work without affecting their research work.

- $600 to $1000 per month.

- The minimum funding package should be over $20,000.

- $25,000 to $30,000 a year.

- Inflation, and its resulting impacts on rent and other basic necessities, should be carefully evaluated to specify minimum amount of appraisal to current funding package.

- At least 30 per cent increase from the current level of dollar amount, or waive the tuition for all RAship and TAship holders.

- I am unable to comment, because while my funding is unable to cover my expenses I am being supported by my partner who works full-time. My impression is that generally funding is too low for those without external support, but I can't give specifics here.

- The package is ideal to live somewhere around Toronto, like Mississauga for example. However, based on the average rent in Toronto and other living expenses it would increase by 10-20 per cent I think.

- More subsidized housing.

- $20,000 plus tuition for MASc.

- $25,000 per year.

- Do a study on rents in the area and cost of transport (TTC/gas) to raise funding packages.

- Calculate the cost of renting and food then you will figure out a minimum amount. Right now, a person needs at least $1,500 monthly to get a one-bedroom apartment in Toronto.
- Surviving in Toronto as a married person requires a minimum monthly cost of living of approximately $4,000 (for a couple) which is far from our funding package. As a result, many students believe that pursuing a PhD program in Toronto may not be a wise decision as they will face both financial difficulties and academic challenges. These financial difficulties could also impact the quality of their research. Furthermore, international students have limited access to scholarships, making it necessary for them to rely solely on their funding packages or work part-time jobs to survive. This can be a difficult task for PhD students who have demanding academic schedules.
- Considering a one-bedroom rental in Toronto is around $2,200 to $2,500, I think the funding should be at least $2,200 x 12 = $26,400 to pay the rent
- Graduate funding should increase at least $500 per month. I'm renting a room right now for $1,200 per month, and monthly payment from funding is $1,500.
- Not sure
- $24,000 instead of $18,500 for PhD students would work
- Yes, an amount based on average monthly one-bedroom apartment, plus food/utilities within a 5 km radius of campus
- Not that I am aware of.
- I believe at least an additional $500 per month is necessary to meet the costs of living in Toronto.
- Insurance.
- For a single student, the cost of living is around $2,000 per month, so an annual total of $24,000 would be better.
- A minimum of $24,000 is required, as the cost of everything increased by 33 to 50 per cent.
- Unsure.
- Increase of the funding package by about 10 per cent would be good relief to counteract inflation and rent increase.
- Room rental is the major cost of living (Please do consider students who are single and have to live alone. Unmarried students are not eligible for cheap family houses. Dorm is also expensive.) Besides, the price of food is continually rising.
- A reasonable mechanism to set basic funding package is to do market research of the median apartment rent cost in downtown Toronto near campus (e.g., the rent for two-bedroom condos last year is $3,000 to $4,000) and food cost for a normal adult (e.g., a lunch combo provided by the food trucks besides GB is about $10). The current base funding cannot even cover rent and food for a decent living.
- Graduate students' quality of life also needs to be considered. Apart from rent and food, there should be extra income for pursuing other activities for well-being, not alone insurance coverage is limited.

- The graduate funding package is not enough to cover basic living in Toronto, therefore I use my personal savings to supplement my cost of living. Over two-thirds of my budget is spent on housing/ rent in a shared household. The dollar amount or mechanism needs to address the cost of renting and living in Toronto.
- Increasing the TA hours. Most courses require TA hours more than the 54 hours.
- At least $2,500 a month
- More TAship opportunities.
- At least $22,000 plus tuition
- I think there can be a small aid to help students against rising inflation.
- The cost of rent is increasingly more expensive in Toronto. Even a small stipend, especially for international students from low-income countries that are further affected by currency exchanges, would make a difference.
- The amount should be aligned with the high housing costs and food expenses of Toronto.
- Nothing in particular, but the current cost of living, especially relatively close to school, is extremely high
- An additional $1,000 top-up on graduate funding would be nice to leave room for any emergencies.
- 1 - Increasing the minimum funding package;
2 - Providing on-campus jobs

Do you have any suggestions for how we might creatively grow our departmental graduate funding pool or improve the mechanisms for establishing our graduate funding packages?

- The Department can open more interesting online courses that will be available to people not only in Canada, but also worldwide.
- Perhaps reaching out to more companies for scholarships that may benefit both parties.
- Increase in alumni events to raise donations
- Perhaps more partnerships with industry that could potentially support students with more funding and mentorship
- I am not sure about that.
- Industrial partners and networks
- There are many scholarships from companies which the Department can facilitate and we are not even aware of it. Some novel research can be presented to companies for more funds in a systematic manner.
- It will be better if the tuition can be directly cut from the package instead of first giving to students and then asking students to pay the tuition.
- Working closely with industry/government partners in projects in which students can be involved and get extra payment for their participation.
- Professors in the department have commented that graduate funding was the same amount at U of T when they did grad studies....increasing funding for all students (not just via scholarships - whose applications take time to fill out and require you to ask for reference letters etc.). Base funding should match increased cost of living.
- I am not sure if this is already being done, but the Department could possibly organize fundraising events with alumni, companies, or general donors.
- More types of scholarships
- Good question. The temptation is to look at the revenue side but maybe the problem is really on the cost side. Having a group or students participate in a session looking at detailed budgets might help the department identify specifically where costs are high for students. My guess is housing and food are major costs. With this information then solutions could be developed which may mean rethinking the students' relationship to the campus (e.g. more online learning), shorter programs with greater summer offerings, etc.
- Maybe try to catch up the funding amount from other departments?
- I don't know how the funding pool really works, but I would think having a conference held in the University can attract attention and sponsors
- One suggestion is to look into accessing Mitacs funding by partnering with companies, which should be a natural link especially for the Department.
- Industry collaboration or giving online courses.

- I heard that the Department sometimes find it hard to get TAs for some courses. As a result, MEng students are allowed to be TAs. Then why don't just cut the number of positions and increase the TA hours per student? So that the MASc and PhD students can get more TA salaries which will better match their contributions.

- Also, based on my experience, some graduate students are not qualified to be a good TA at all. As a result, in a TA team, the good TAs spend much more time for a high quality of work while they got the same amount of salary as the bad TAs. There is a huge problem here: the absence of a mechanism to encourage TAs to do better jobs. I know that a professor once had to hire someone as a TA who didn't do well last year for the same course, because that professor had no choice. I suggest a blacklist system - once a TA receives a lot of negative comments from the students or instructor, he/she cannot get TAship for the next term. In this case, we can cut the number of TAs in half and double (or more) the salary per TA. The current TA system in our department seems to be a practice of equalitarianism; unfortunately, it's not efficient at all - the capable TAs are not awarded enough and the students in the courses are not receiving good quality assistance.

- Decrease the number of research-based graduate students

- This is a simple financial management issue. As a Civil Engineering student, I do not possess sufficient knowledge and expertise to provide solutions. We should ask for help from experts. Honestly, I have a couple of ideas, but I don't know if they will work, and more importantly, as a PhD student with several courses and TAs and research and everything else, I do not have the time to come up with solutions and analyze them thoroughly. Use experts. Consult with brilliant people from the business and economics department.

- Engage more student activities and try to foster more events.

- Also maybe a better (and more advertisements) at central locations to be able to get/reach things that are relevant to students.

- The cost of living in Toronto is largely driven by the cost of housing. The U of T is a large university, a large land owner with the resources and the land to build / rent the affordable student housing. New student housing can help to alleviate the largest source of the financial distress for the existing students and will attract the potential graduate students as well. The amount of the package should be tied to the actual cost of living in Toronto and updated regularly as the prices rise.

- Since the Department has set the minimum funding so low (below living wage), this enables supervisors to bring many students. However, the quality of work from the students is much lower, since they have to seek other opportunities in order to fund their living expenses. This means that by setting higher minimum funding requirements, supervisors will have to focus on quality rather than quantity.

- Also, other Engineering departments within U of T have much higher minimum funding, which means it is possible to do so and it highlights the discrimination between U of T students based on their department's capabilities. The problem is not about having limited resources, but rather about how we decide to distribute them.

- I'm not sure I understand this question. Perhaps industry partners who want to take advantage of U of T's high-quality, low-cost PhD consultants can have a mechanism. Maybe these partnerships need to be associated with a dollar figure.

- Through fundraisers?

- As a student, I do not know too many methods to earn extra money. I only know a TA position and scholarship(s) could bring me some income. While the total amount of TA pay is constant, the scholarship is competitive, particularly for our international students. I know it is not the fault of supervisors or the Faculty, but you can figure out some good methods to solve this problem. Personally, I think we can provide some job positions for students to do some fundamental work, or increase the total time amount of TA positions. (For me, I will be a TA this semester, but this course has only one TA in total. So I do all the jobs myself, which is pretty time-consuming, and I spend more than four hours per week on average, which means my total working hours will exceed 50 hours a semester.)

- - Make more connections with industries and companies for collaboration between academia and industry to receive grants and funding from these companies and industries.

  - Most of the scholarships are highly competitive and usually tend to land in specific departments, majors, and students' background and level. In other words, I think scholarships are not widespread eligibility wise. Also, most of them are for domestic students. This is while, on average, international students have more financial problems. Also, scholarships sometimes are a few but for very large amount(s)! I am not sure if it is a good approach for only one student have a super luxury life by receiving a huge grant. While this big amount of money could make a couple of students' lives better on average and more comfortable.

- Partner with companies to do the work

- Unfortunately, designing funding frameworks and financially managing multi-million dollar academic departments isn't my strong suit, I study bacteria and sulfur.

- It is unclear why a portion of scholarship money awarded to graduate students never makes it to their pocket. For example, I believe OGS is typically $5,000 per session, but actually amounts to $3,333 per session. If these scholarships could be awarded in their entirety or awarded as the true dollar amount students will actually receive, it would help increase finances or at least provide clarity.

- I might be shooting over the stars, but a new system to manage research funds at the University is needed. During one's stay as a graduate student, we are on many projects and project proposals, and we are aware of many collaborations that happen with industry or governmental entities to do research. But our funding package is not dependent on the value of these projects, although sometimes the numbers are pretty high. I believe that a fixed percentage should be allocated for the student who is directly working on the project. If this percentage exceeds their minimum funding that is paid from the supervisor's research account, they should get it as a top-up. And if the student is working on two projects, then they should also receive this amount from both projects.

- The best way is to attract the attention of companies willing to pursue joint projects (academia-industry) to create external funding for graduate students.

- Urge federal or provincial agencies to increase graduate funding and scholarships. For example, the value of NSERC scholarships has not increased in the last few years, despite increased living costs and inflation. Increasing the number of scholarships granted, instead of increasing their value, could also help graduate students.

- Formalize the flexibility to work internships while pursuing a degree.

- Establish partnerships with government and industry

- Not enough funding for International students to support their studies in U of T

- Take in fewer students

- [Increase available] Part-time jobs in the Department

- Funding collaborations with industry might be a good way to go. I have seen some awards from companies, but they are often quite restricted in their eligibility.

- Industry partners should become bold; supervisors should guarantee sufficient funding packages for PhDs rather than leaving it on our shoulders to spend weekends on part-time general jobs. Also, providing internship opportunities so we can save some money for the rest of our program could help. Some supervisors do not have strong connections with the industry, which can lead to the low chance of internship opportunities for their students. Also, there are a lot of successful scholarships available for domestic students, while international students have fewer opportunities. Maybe [the disparity] can be [overcome] by planning for internal scholarships in the Department for international students.

- No, but I sincerely hope it can be grown for the well-being of other grad students.

- I suggest to offer more scholarships for international students as most of the scholarships now are directed to domestic students.

- By creating more research areas where funding will be granted from government and industry.

- More partnerships with industries, for example, by making it possible for graduate students to obtain part-time work in the industry.

- 1. The rent has been the highest contributor to student expenses. For example, in the first year of my PhD (2019) rent was 100 per cent of my funding - I lived with the support of my spouse. Currently, rent is roughly 75 per cent of my funding (excluding TAship). I think as long as funding compensates for the increase in rent and inflation going on in Toronto, it is reasonable. Student income minus expenses should not equal zero [or lower] at the end of the month.

  2. Secondly, funding is not [in line] for someone with a spouse/partner, or a child in their home. I am unsure how to account for this in the funding, but I think this section of the student population is left out. However, I would like to admit that my supervisor has been somewhat supportive in the first two years of my PhD. Last year, I did an extra TA position (five TA positions per year) to back it up rather than asking them every time - but it affected my progress.

- Pooled industry sponsorships. Ask large industries to offer considerable funding to a collective pool (not lab-specific funding) in return for a two-year employment contract of a PhD candidate upon graduation - and ask students to register for these spots once they complete their comps. Then split the funding over the graduate student population within the Department. Private employers will often fund some graduate school [education] for their own employees and PhD are valuable candidates - so I imagine this could work.

- By increasing the researchers' funds payable while applying for funding

- Research internships - students from Computer Science do internships related to their research during the summer months.

- Provide more affordable housing options

- Partner with industries and accept from them short-term, paid consulting work that would be completed by students at an hourly rate;

- Absolutely, through research projects. I have worked on many research projects which received funding of hundreds of thousands of dollars without receiving any academic or financial credit.

- You can link students with related part-time jobs so that they can earn more and learn job roles.

- Link our research to industry to get more funding

- More TA hours for TA appointments.

- Host conferences, try to push or align Mitacs for students which may lead to more long-term partnerships with industry partners, allow labs to take on commercial lab work (i.e. lab space that can be rented and/or lab space where commercial samples can be run allowing for generation of funds, CALA regulated labs), have students required to take fewer courses since most research categories don't have four or more courses available (fewer TAs, professors, etc. need to be paid)

- - Partnerships with companies for internships or work/study programs

  - Scholarships for international students (most are only available to domestic students)

  - The University makes quite a lot of money from property it owns throughout the city, tuition, and donations

  - I don't understand why so little of this money makes its way to the students.

- Give more scholarship opportunities, even smaller amounts (e.g., less than $1,000) to international students. Scholarship [availability] is way too competitive, so that very few international students are eligible/able to receive one. Also, create more part-time jobs within the Department students can obtain. Senior PhD candidates are also very familiar with project management, financial works, and mentoring. We are very capable and able to work 10 hours a week part-time.

- More TA opportunities allowed per term, more RA opportunities

- More industrial collaboration could help bring funds to the Department.

- We should get at least a minimum wage - not a stipend depending on our nationality. This double standard significantly decreases the quality of students the Department is attracting. Very sad.

- Thank you so much for this question. I may not have extensive experience in this area, but I would like to offer the following suggestions as a starting point for further consideration.

  1. Explore external funding sources - such as grants, sponsorships, and partnerships with organizations that share similar goals as our Department.

  2. Consider ways to redirect departmental budgets to graduate student support in order to optimize internal resources.

  3. Encourage interdisciplinary collaborations - partnering with other departments, schools or universities could lead to additional funding opportunities.

  4. Diversify funding options - consider offering stipends, fellowships, assistantships, and research grants to students.

  5. Engage with alumni - reach out to alumni for donations, mentorship opportunities, or connections to potential funding sources (One of the most efficient ways)

  6. Encourage student entrepreneurship - provide resources and support for students to develop and commercialize their research projects, which could generate additional funds for the Department.

  7. Apply for government grants - search for relevant government funding programs in the areas of infrastructure, environment, and sustainable development.

  8. Collaborate with industry partners - work with engineering firms, construction companies, and consulting organizations to secure funding for joint research projects.

9. Developing and monetizing online courses, tutorials, and other educational materials to generate additional funds for the Department.

10. Engage industry professionals through hosting conferences, seminars, and workshops, and solicit sponsorship funding.

11. Promote the application of research awards, prizes, and contests - encourage students and faculty to apply for research awards, prizes, and contests.

12. Apply for endowments - consider establishing endowments to support graduate students in your department, which could be funded by alumni, industry partners, or other supporters.

- Increased collaboration of research labs with industry partners can increase the funding that will be available for graduate funding.
- Alumni outreach, government intervention, public fundraisers.
- 1. Need more private funding/industrial collaboration.

  2. Growing startup incubator in exchange for a stake in the startups.

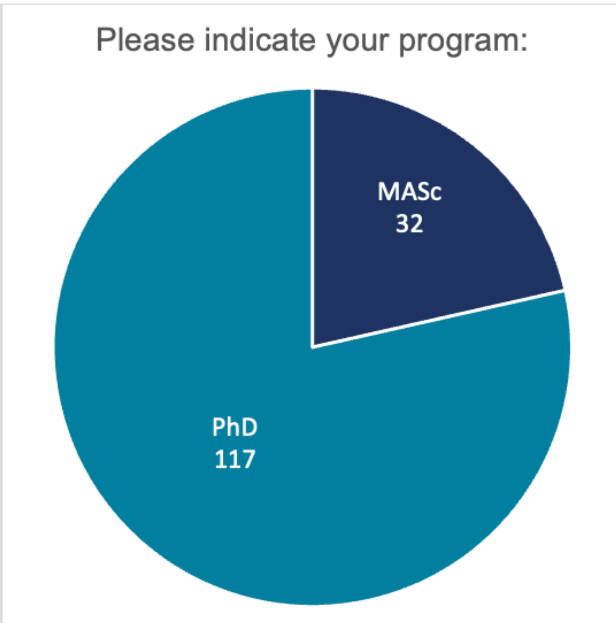
  3. Establishing industrial training certificates

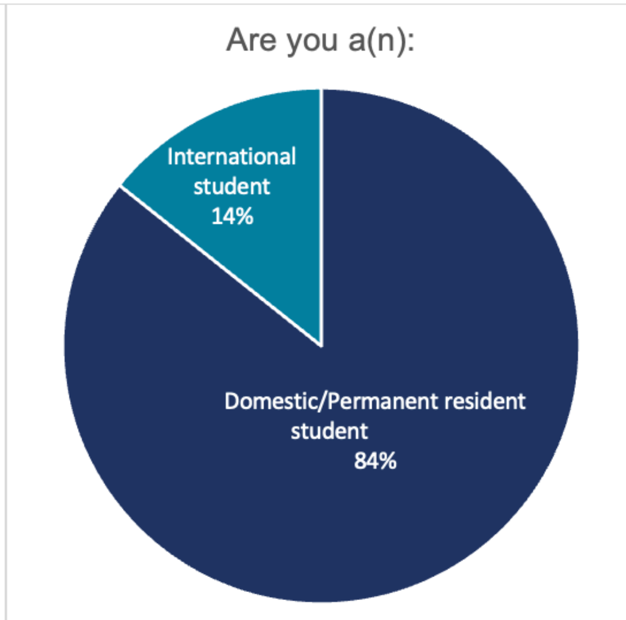
  4. Allowing the students to work from other cities (where applicable) to reduce the burden of renting in Toronto.
- Maybe it would be less stressful for students if the tuition fee would be deducted from the funding package before offering them. Having to pay the tuition fee is sometimes super stressful for students.
- Also, increasing the number of scholarships in the department may also help.
- Get the large consulting and construction companies to formulate research areas with the themes important for those companies; often, research is so removed from practical needs and if such connection can be established, more funding could be available for university research.
- More grants from additional sources so the pool of funding is larger; government funding for community service related to research projects (also has the benefit for students of practicing science communication and getting people engaged in citizen science).
- If possible, provide at least two TA opportunities per semester, instead of just one. That may provide students with the required $5,000 per year to fill the gap.
- There might be a few options:
- Introduce paid part-time R&D consulting opportunities to graduate students.
- Allow students to prepare grant applications with their supervisors. Students must then spend time executing the grant by doing research-related work such as data collection, writing, etc.
- Industry partners, government funding and more university housing
- Reach out to impactful alumni and strike more deals with industry partners.
- One possible way is to waive the tuition fee

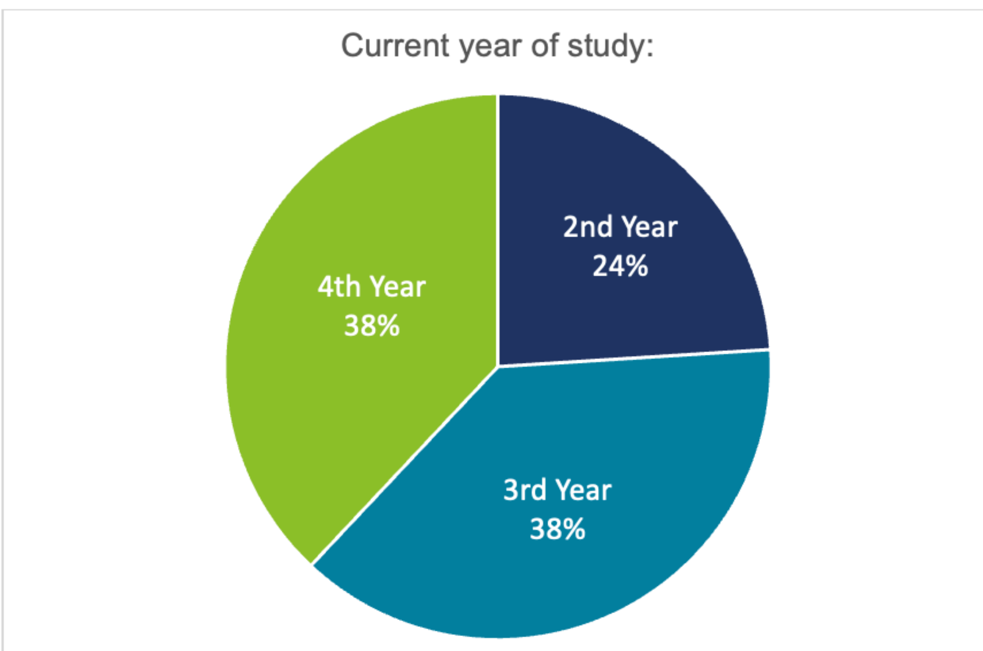
Appendix: A.8 Department of Civil & Mineral Engineering Self-Study 2022 Survey Results Graduate - Professional Programs

Department of Civil & Mineral Engineering:
Master of Engineering (MEng)
Master of Engineering in Cities Engineering and Management (MEngCEM)

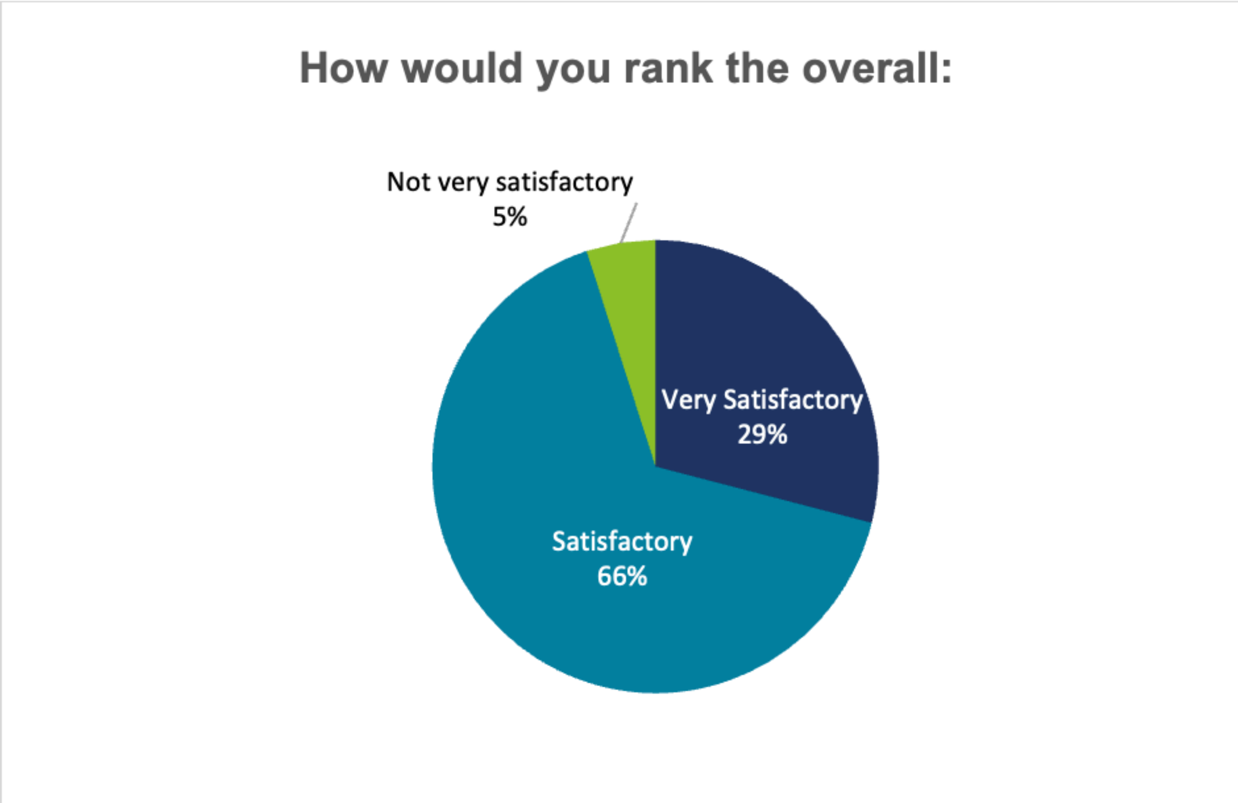
ABOUT YOU:

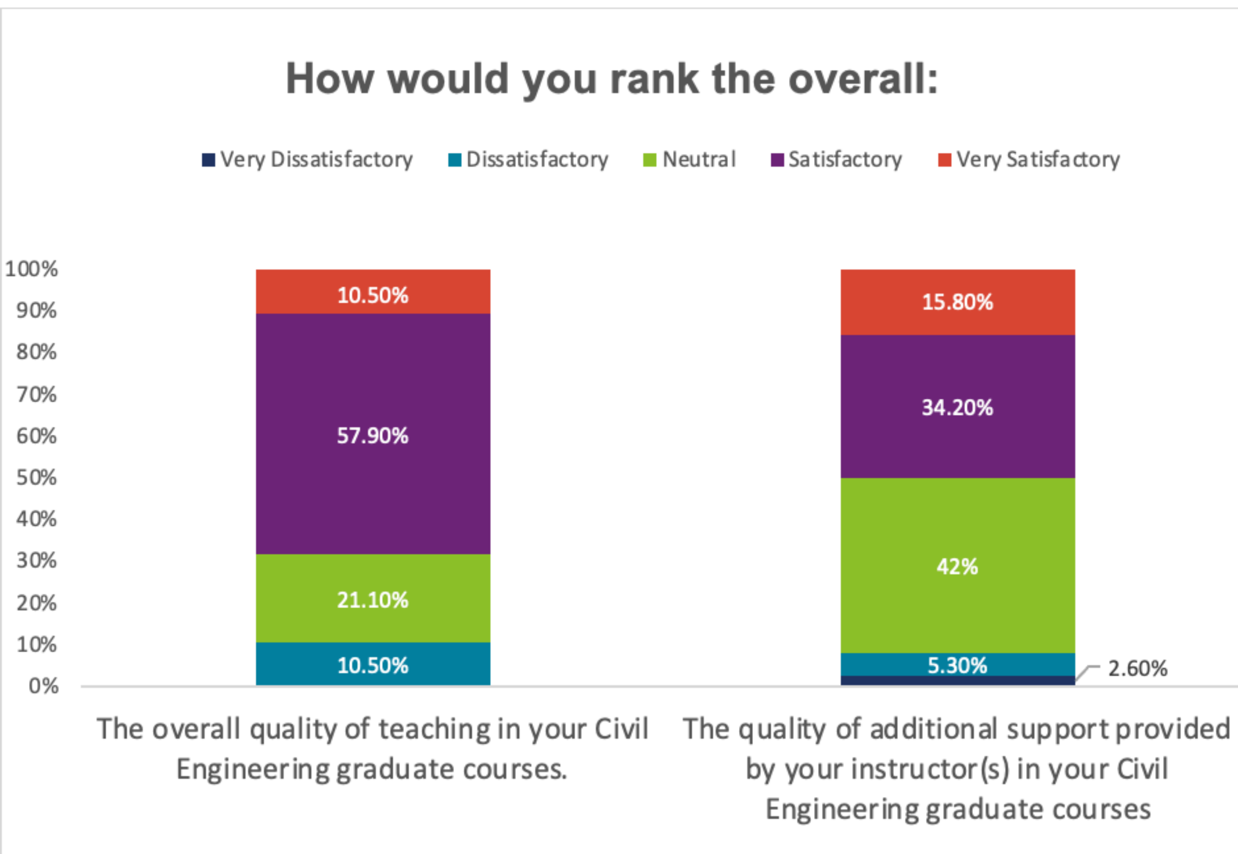


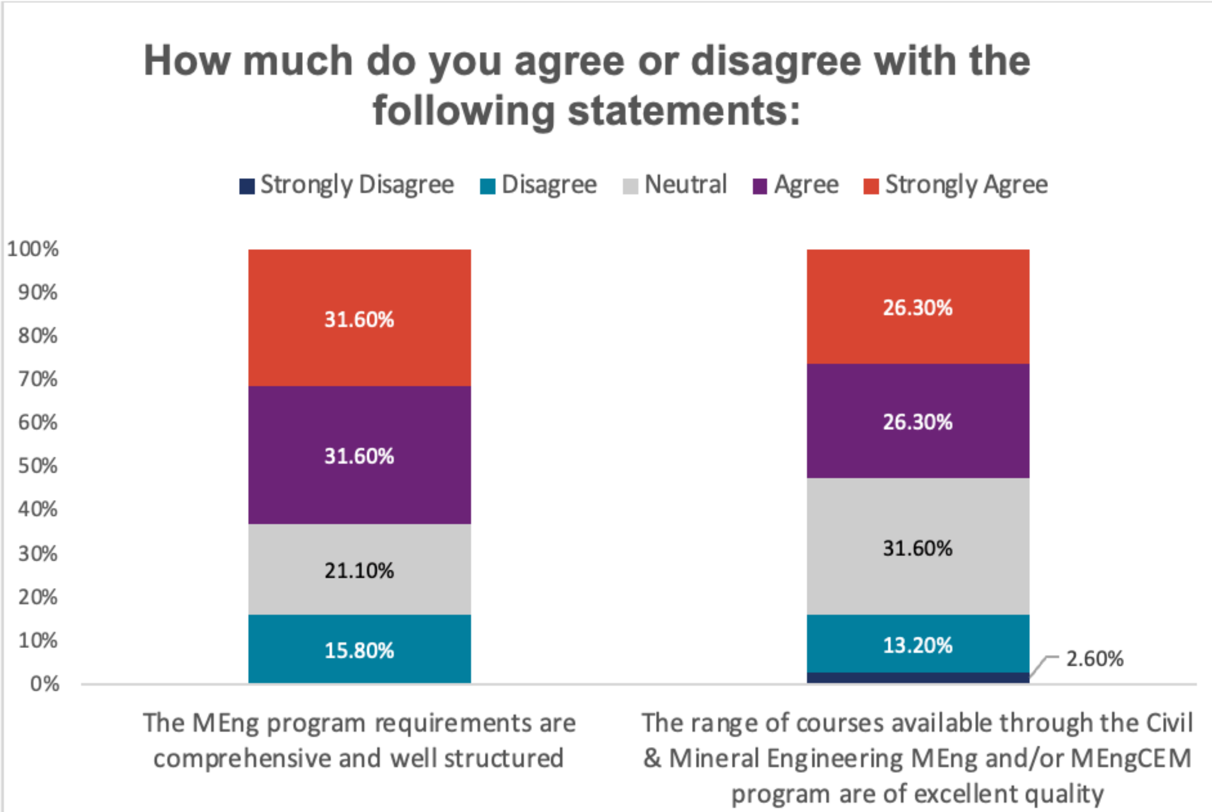


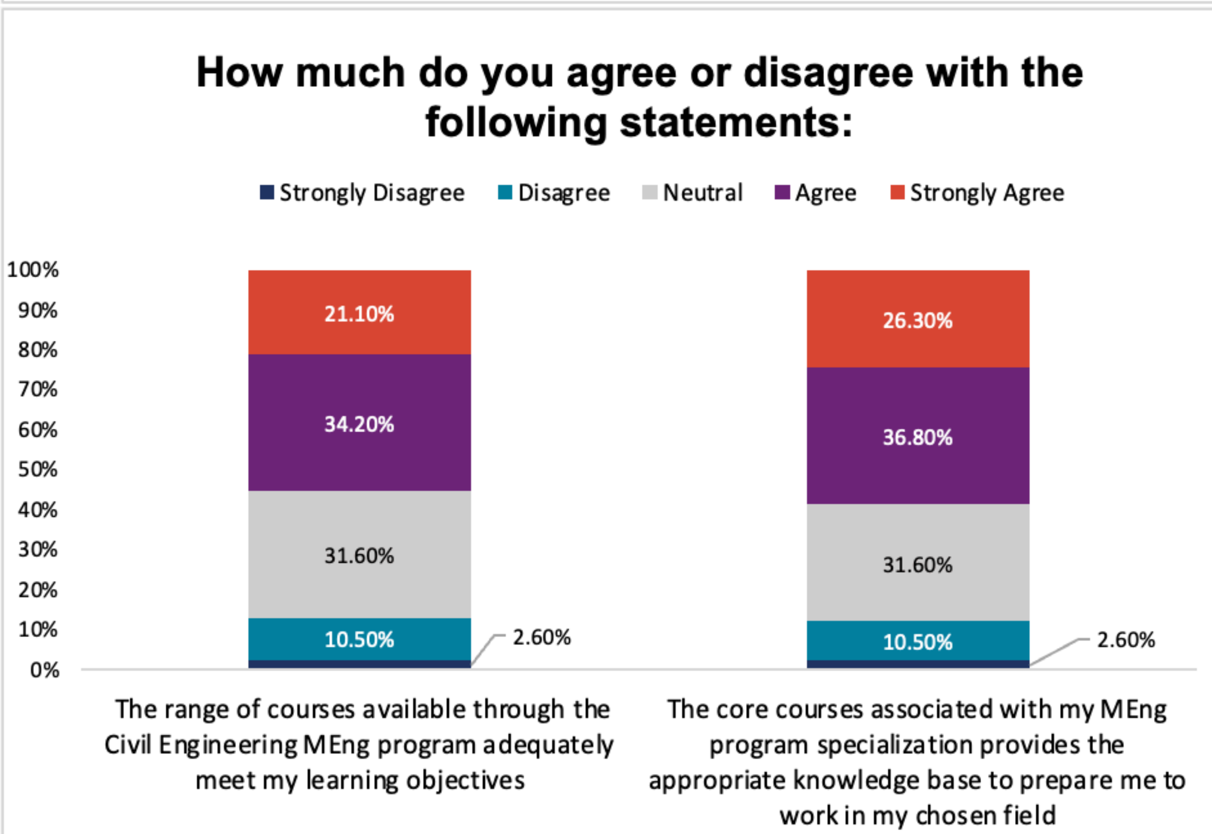


ACADEMIC:


How would you rank the overall:
Not very satisfactory 5%
Very Satisfactory 29%
Satisfactory 66%

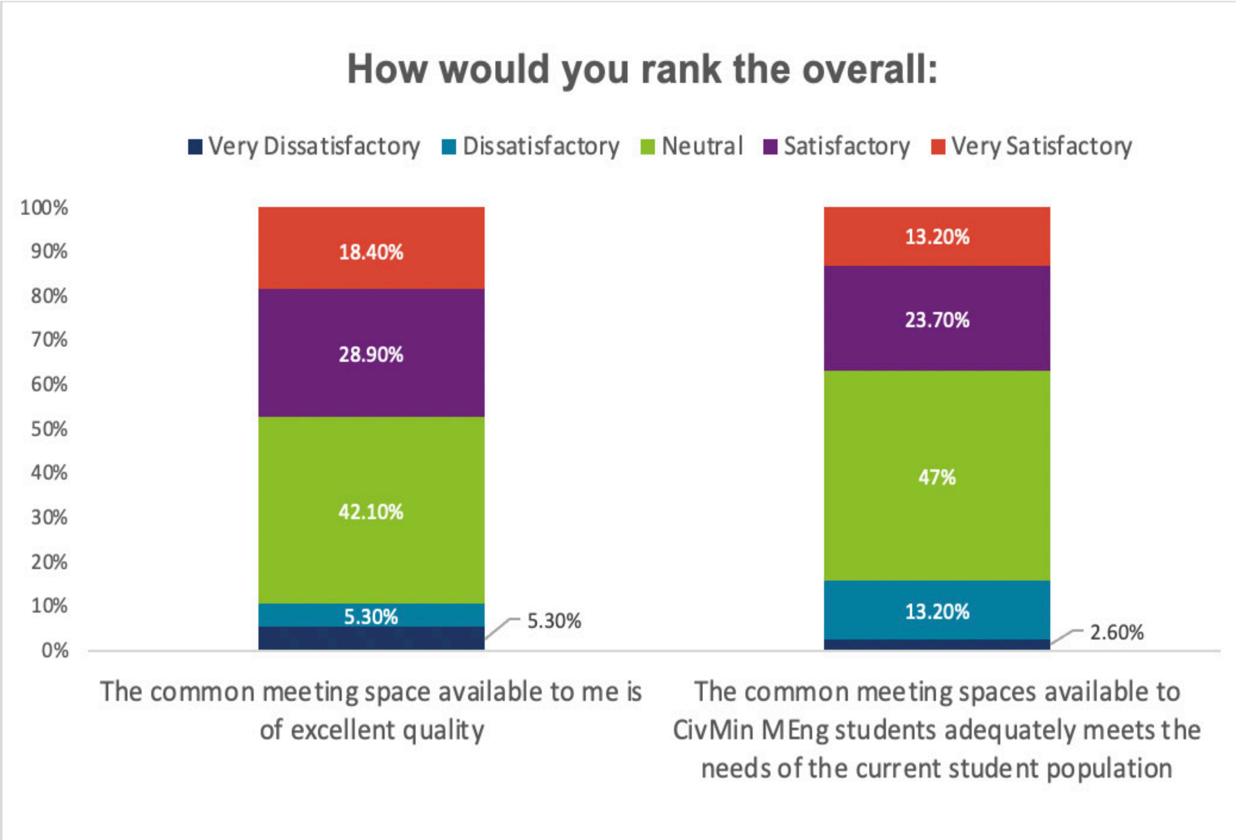

How would you rank the overall:
Very Dissatisfactory
Dissatisfactory
Neutral
Satisfactory
Very Satisfactory
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
10.50%
57.90%
21.10%
10.50%
15.80%
34.20%
42%
5.30%
2.60%
The overall quality of teaching in your Civil Engineering graduate courses.
The quality of additional support provided by your instructor(s) in your Civil Engineering graduate courses


How much do you agree or disagree with the following statements:
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
31.60%
31.60%
21.10%
15.80%
26.30%
26.30%
31.60%
13.20%
2.60%
The MEng program requirements are comprehensive and well structured
The range of courses available through the Civil & Mineral Engineering MEng and/or MEngCEM program are of excellent quality

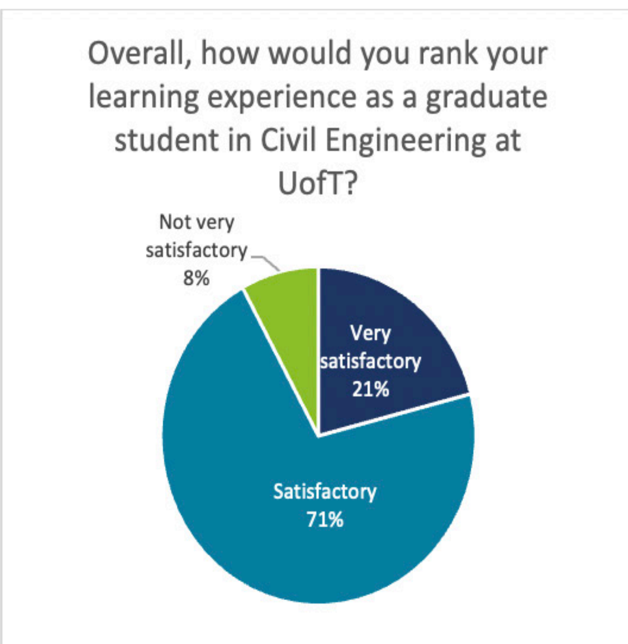

How much do you agree or disagree with the following statements:
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
21.10%
34.20%
31.60%
10.50%
2.60%
26.30%
36.80%
31.60%
10.50%
2.60%
The range of courses available through the Civil Engineering MEng program adequately meet my learning objectives
The core courses associated with my MEng program specialization provides the appropriate knowledge base to prepare me to work in my chosen field

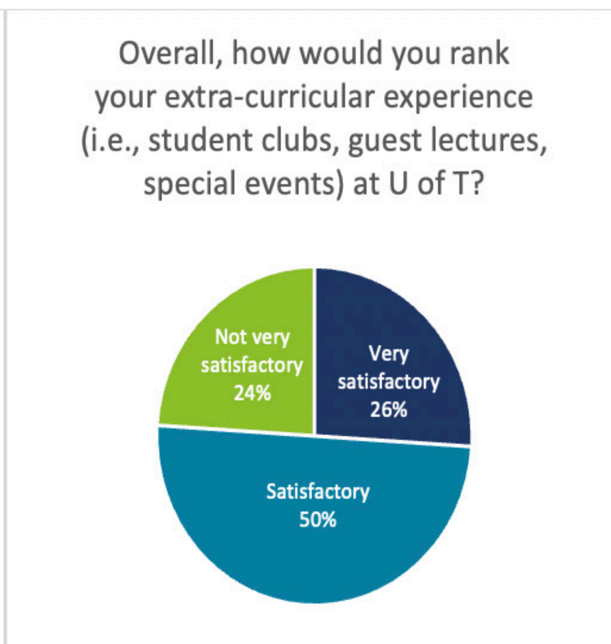
FACILITIES

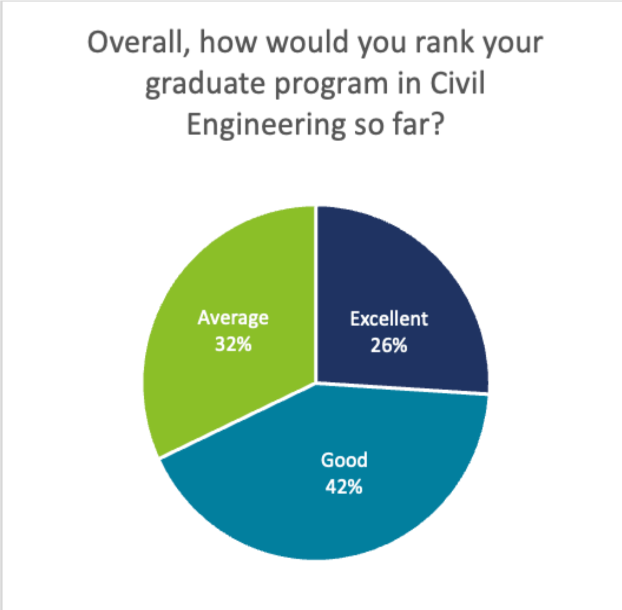
Common room/Student Club Facilities:

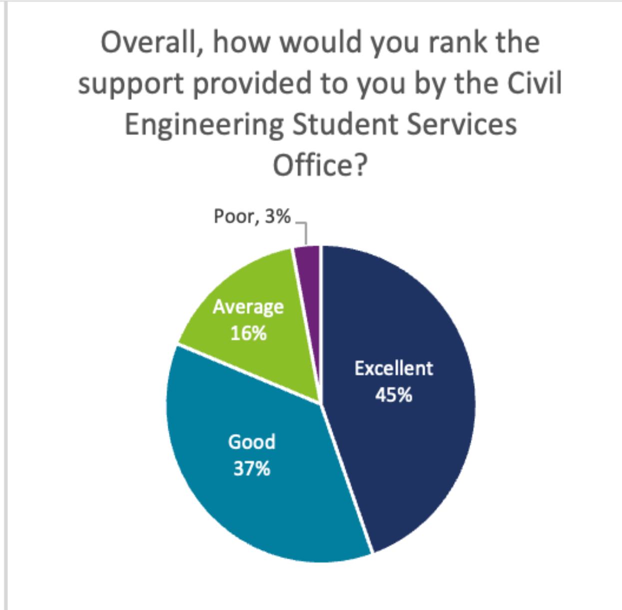


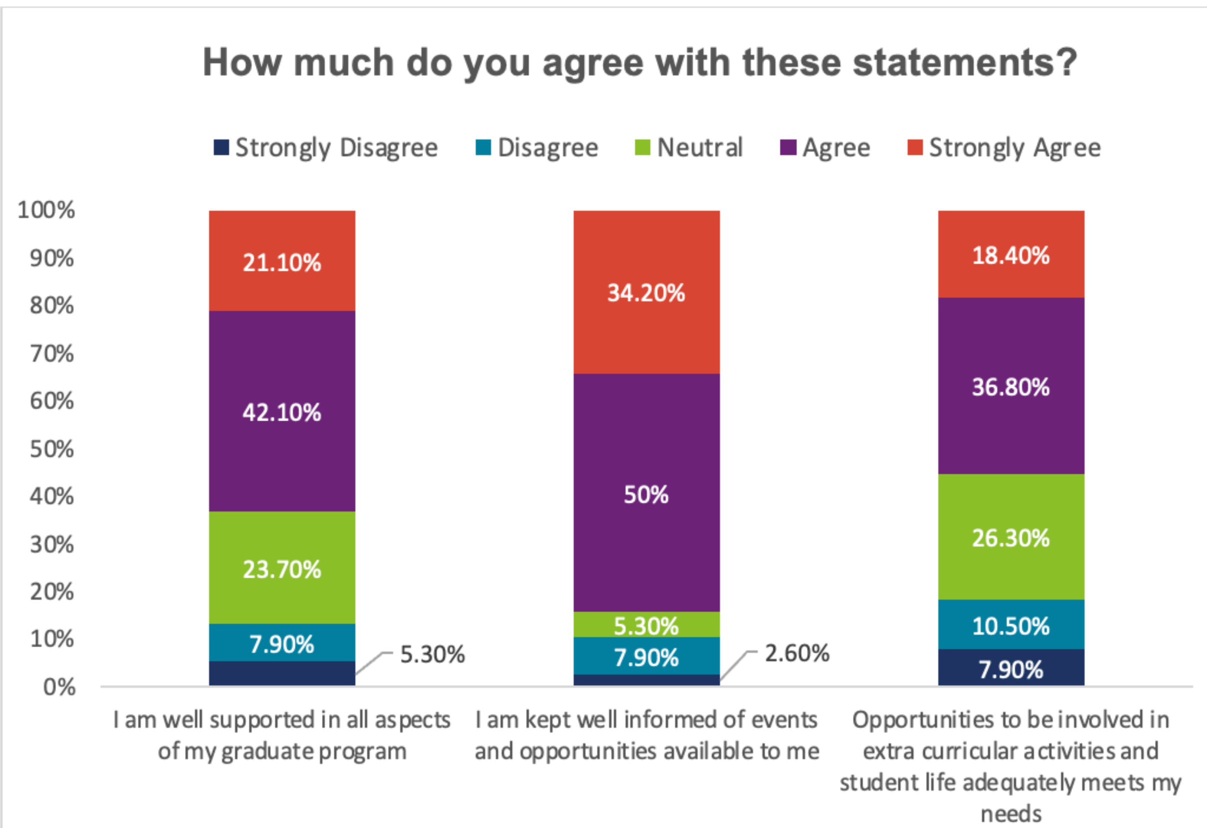
STUDENT EXPERIENCE:



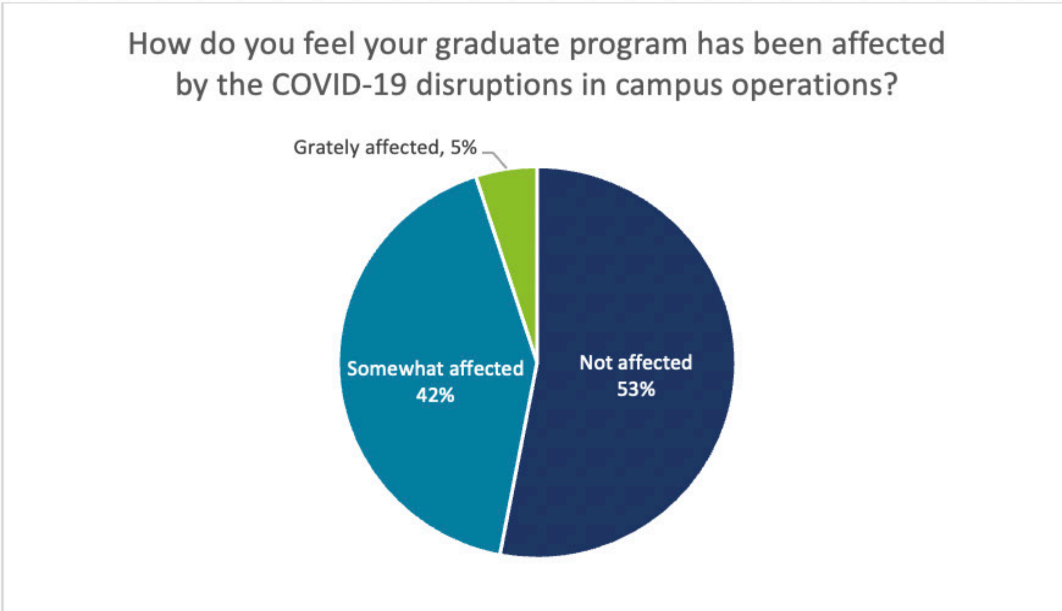


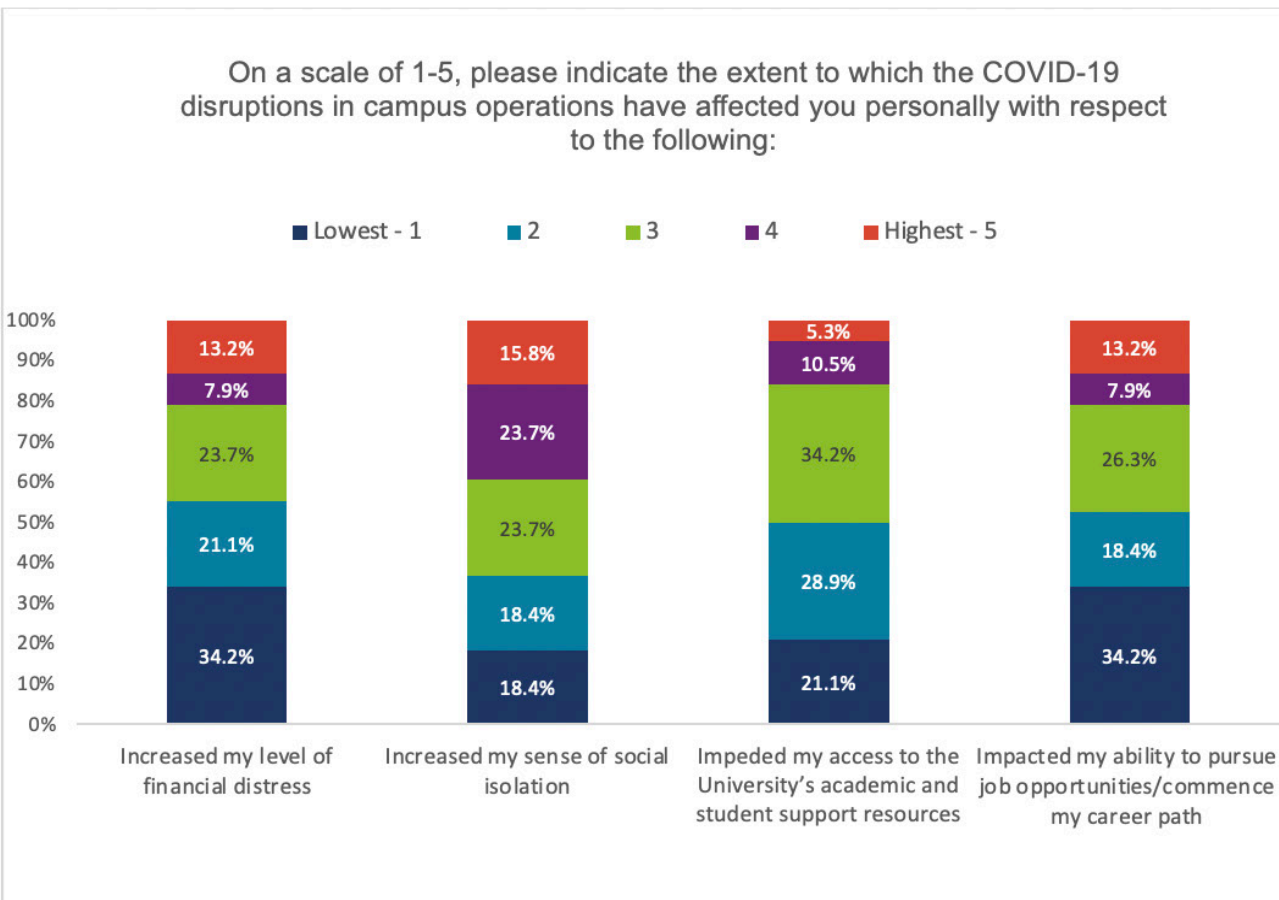

Overall, how would you rank your graduate program in Civil Engineering so far?
Excellent 26%
Good 42%
Average 32%

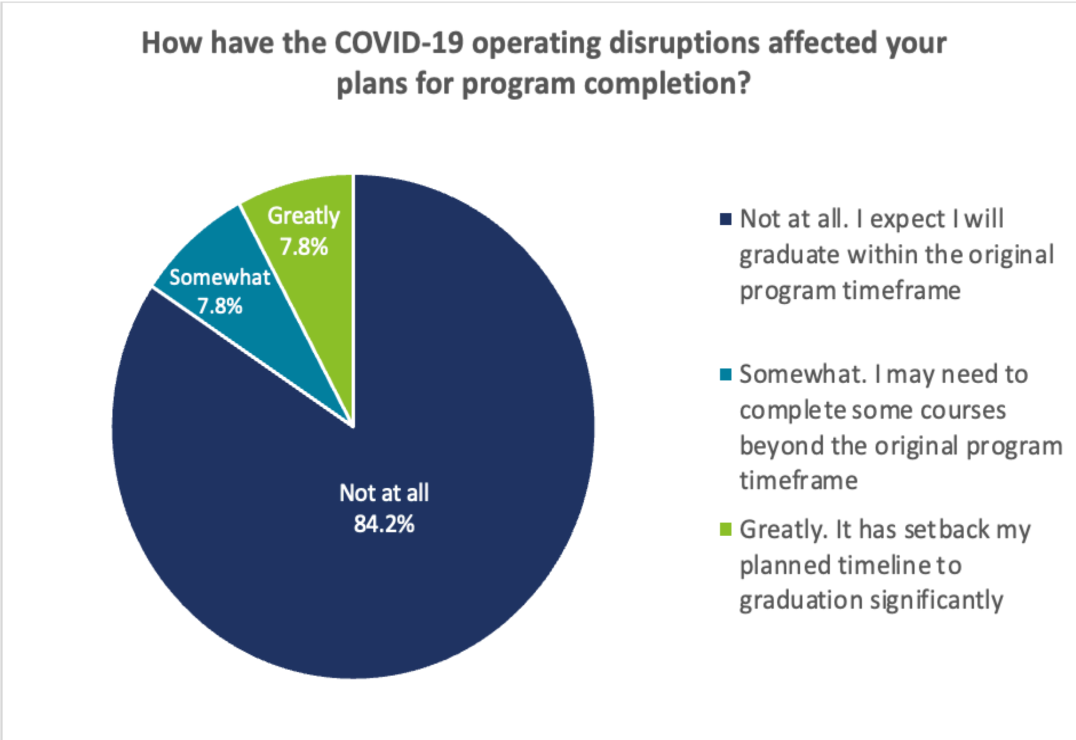

Overall, how would you rank the support provided to you by the Civil Engineering Student Services Office?
Poor, 3%
Average 16%
Excellent 45%
Good 37%


How much do you agree with these statements?
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
21.10%
42.10%
23.70%
7.90%
5.30%
34.20%
50%
5.30%
7.90%
2.60%
18.40%
36.80%
26.30%
10.50%
7.90%
I am well supported in all aspects of my graduate program
I am kept well informed of events and opportunities available to me
Opportunities to be involved in extra curricular activities and student life adequately meets my needs

IMPACTS of COVID-19 DISRUPTIONS IN OPERATIONS:







DIRECT STUDENT COMMENTARY

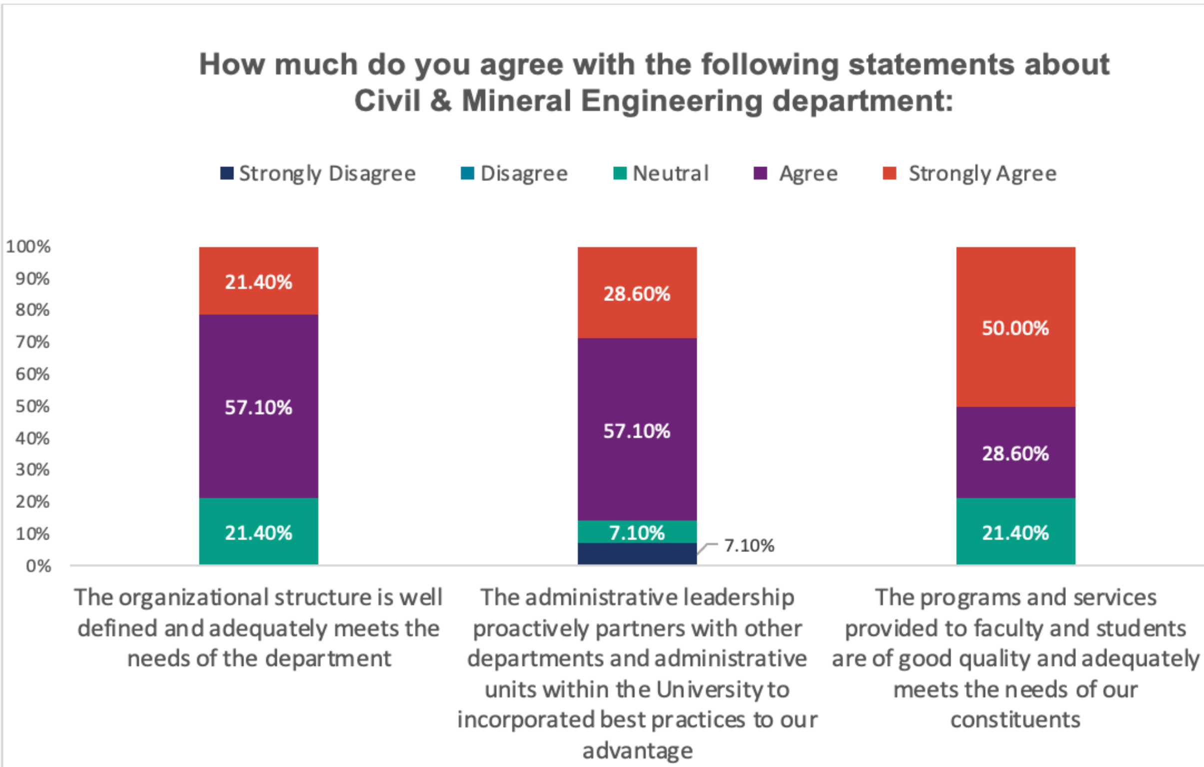
- Took an extra year to finish the program. At least there is an option for extended full time in MEngCEM, I'm thankful for that.
- Please include summer internships for international students. Please consider promoting group studies and group projects and group activities, it is much needed.The concept of doing everything individually makes it very stressfull and there is no interaction with people around. In my first semester, there were hardly 20-25 interactions made during class. No one talks to no one. Everyone wants to interact but post Covid condition has made it awkward. It's a humble request to increase group projects, may the difficulty level of assignments increase, but in group people learn more. Together the progress is more and reduces anxiety. Please make this happen at the earliest for all the courses. So far, there has literally been JUST ONE group project, and that too because of a new professor. I am glad he is hired. We are doing too good in that course and it's enjoyable as well !!
- I was admitted to my program in Fall 2020 but I had to defer my admission by one year as I didn't want to study online. Hence my program completion was set back by one year.
- Perhaps an additional term.
- For some of us, especially local students, Covid has been the opportunity for entering a graduate program. The online options have improved access to courses that I normally could not take due to my work schedule.
- The department doesn't offer much full version Civil Engineering software to students which are necessary for learning purposes and also to become industry ready, where many top universities of the world do!

- We are all aware of how vital finance is in every sector. And more so in the construction and project management sector, where we deal with billions of dollars. But unfortunately, there are no specific courses in our civil department that help bridge finance and project management. Therefore, I request you to introduce a new course, 'Project Finance', in our department, with Mr. Arsalan Zargar as faculty. I think students pursuing construction management emphasis would be interested in taking this course. Also, there would be certain students developing an interdisciplinary career in finance and project management, like me, who would also want to study such a course. I recently met Mr. Arsalan in CIV580: Engineering and Management of Large Projects, where he was our guest speaker representing Infrastructure Ontario. He has a fascinating and diverse career background. Prof. Daniel Posen will be able to provide a better background about Mr. Arsalan. The noteworthy point about Mr. Arsalan is that he teaches a 'Project Finance' course to graduate and executive students at Schulich Business School, so he already has developed course material to teach the topic. I have also emailed regarding this to Nelly. Other than that, everything's just as it needs to be, I think.

Appendix: A.9 Department of Civil & Mineral Engineering Self-Study 2022 Survey Results - Administrative and Technical Staff

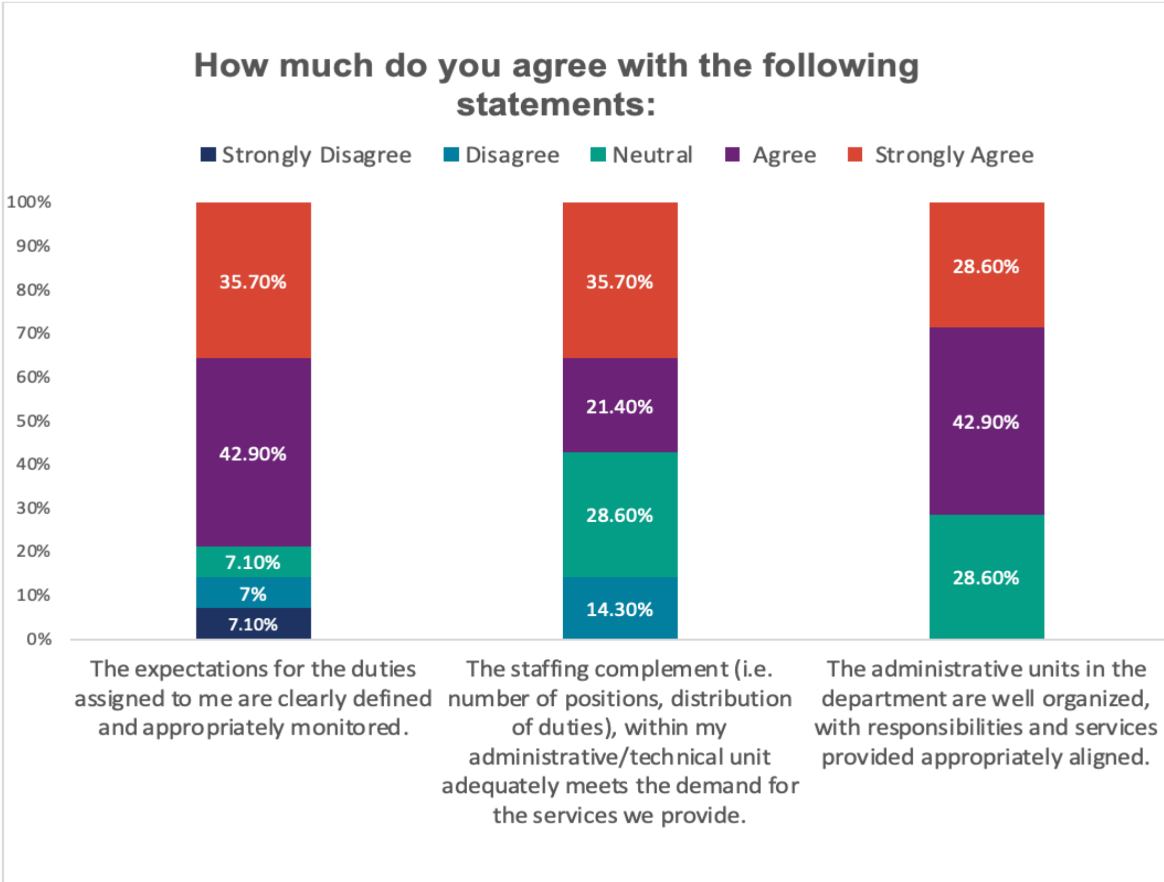
SELF-STUDY SURVEY 2022-23 - ADMINISTRATIVE/TECHNICAL SERVICES + IT STAFF

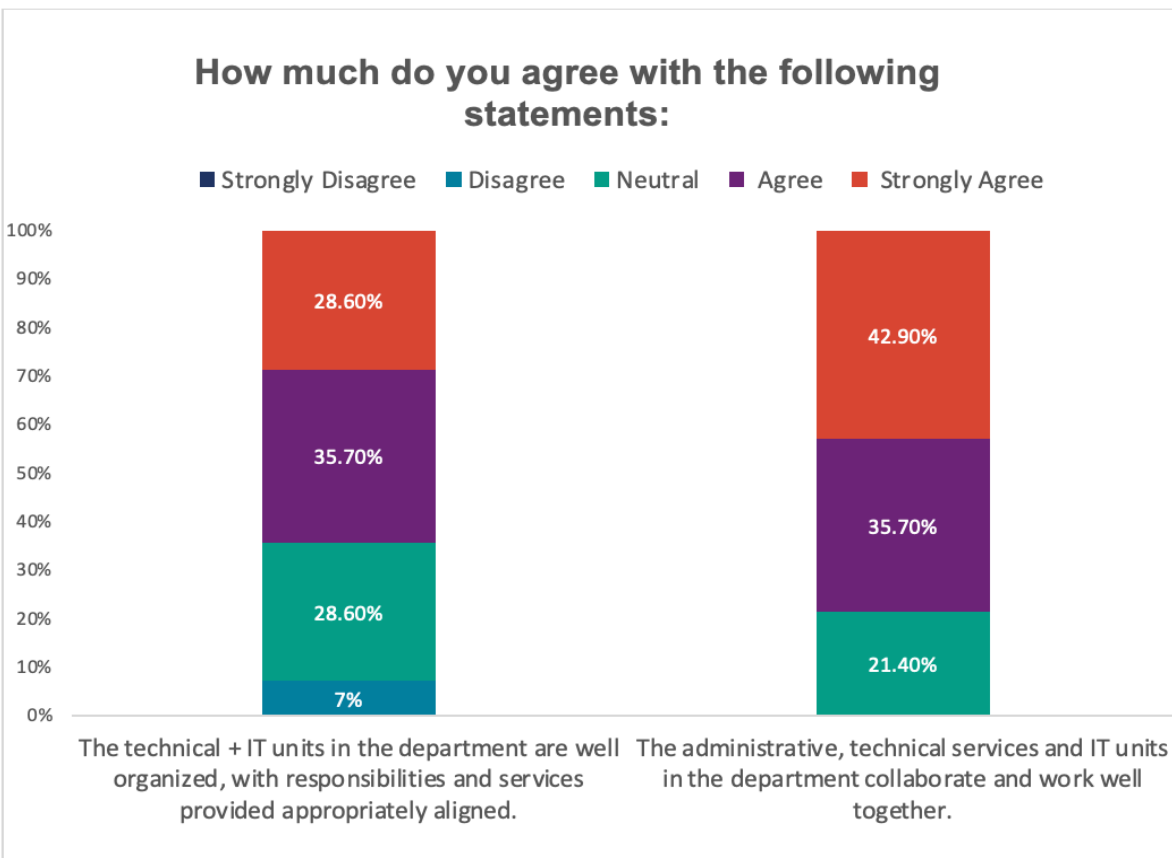
ORGANIZATIONAL:



Is there any further comment you would like to make about organizational structure?

- Engineering is actually my favourite place I've worked since I began at the University of Toronto. From the leadership down to administration, I always feel supported and helped.
- Some services the Department offers are not clearly stated on who is handling it and supporting these issues. It takes time to get the right person to help resolve the issues. Some routine items are not clearly documented and need process flow and automatic notification to make sure the work is completed.
- Sessional instructors/TA's are overlooked and need more support/mentoring. The professors (especially new) also need more active supports for understanding faculty regulations, scheduling, room booking, etc. and teaching support. Supports for undergraduate students could be more robust, more learning strategist support in the Department, not just faculty wide or peer mentoring, etc.
- The structure itself is fine, and makes sense. I gave 4 instead of 5 because onboarding could be smoother. When I started here not long ago, it took a while to figure out the structure and the CivMin "way" of doing things. When asked, people provided clear information but sometimes you don't know what to ask! The department is very "all in this together" but onboarding information would be helpful.


How much do you agree with the following statements:
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
35.70%
42.90%
7.10%
7%
7.10%
35.70%
21.40%
28.60%
14.30%
28.60%
42.90%
28.60%
The expectations for the duties assigned to me are clearly defined and appropriately monitored.
The staffing complement (i.e. number of positions, distribution of duties), within my administrative/technical unit adequately meets the demand for the services we provide.
The administrative units in the department are well organized, with responsibilities and services provided appropriately aligned.


How much do you agree with the following statements:
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
28.60%
35.70%
28.60%
7%
42.90%
35.70%
21.40%
The technical + IT units in the department are well organized, with responsibilities and services provided appropriately aligned.
The administrative, technical services and IT units in the department collaborate and work well together.

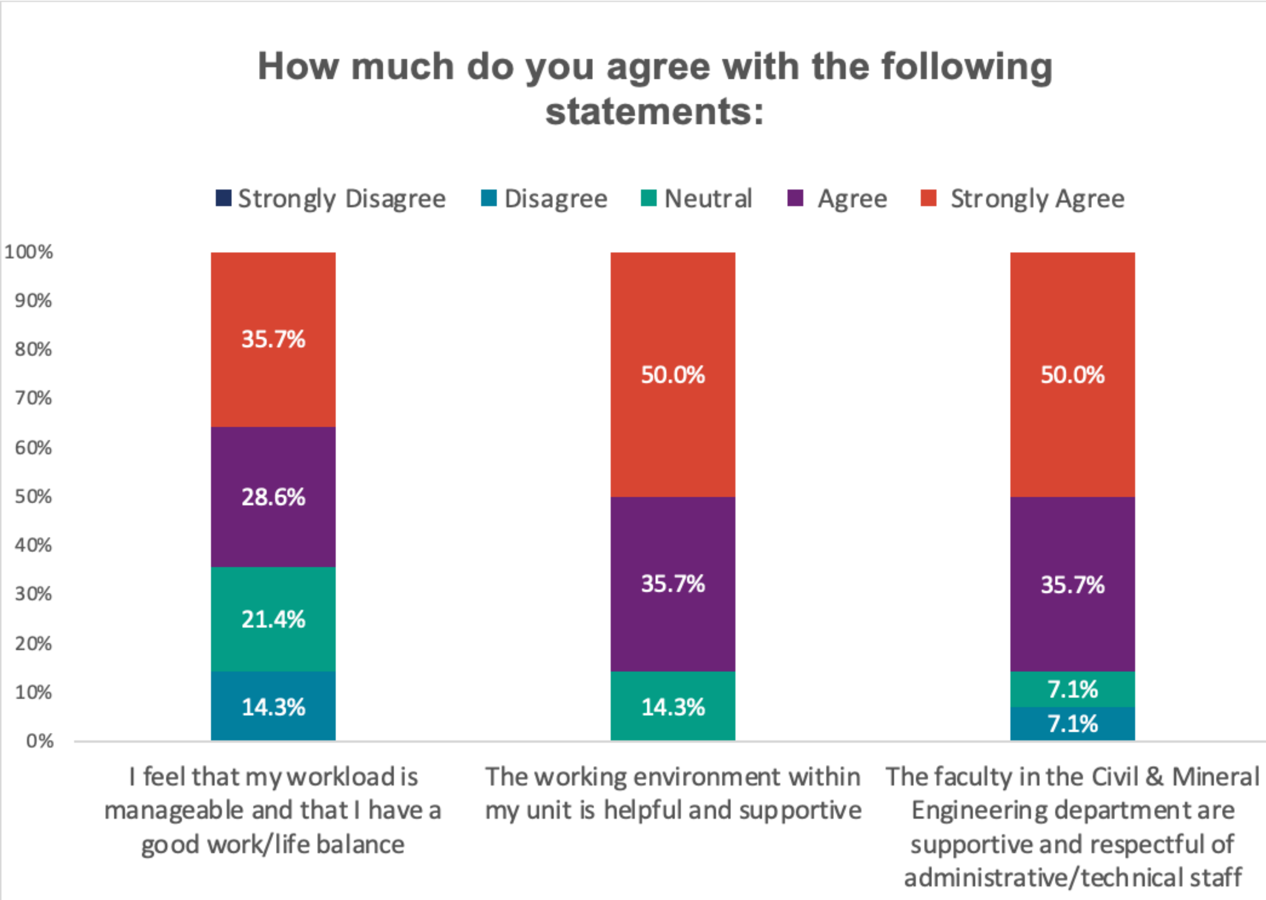
Is there any further comment you would like to make about administrative/technical units?

- More collaboration with proceeding documentation how services operate within the Department is need to be shared, especial during onboarding.

- Like any place, there are some “holes” that create some confusion and scrambling or more than one person doing the same thing. We could use a dedicated webmaster (the web is an important communication tool), so that information, structure, style is consistent throughout. The way we save and share documents and information could be more consistent - such as creating documents or tools that share information and make it easier for everyone to use that information for their purposes. An example is TA’s getting access to the photocopy room - a system where Student Services “clicks” a checkbox when the TA contract comes in, then Tech Services can use the info to grant the TA access to the photocopy room). There could be more, but I think a few projects could minimize back and forth, etc.

- As an almost-new member of the Department, I think onboarding could be improved. I had my job description as a big picture and my direct manager assign me the tasks as it comes available. The details of responsibilities for the role, or documented guidance were missing. This could be because of getting hired during COVID, but it took me a while to define the role and partner with the Department and Faculty. An onboarding framework for staff and faculty would be helpful. A welcome package including processes and procedures required for new hires and a checklist to keep track of progress. The collaboration within the administrative unit could be clarified to increase efficiency. Developing common documentation to be shared with members encourages team members to effectively communicate on a day-to-day basis.

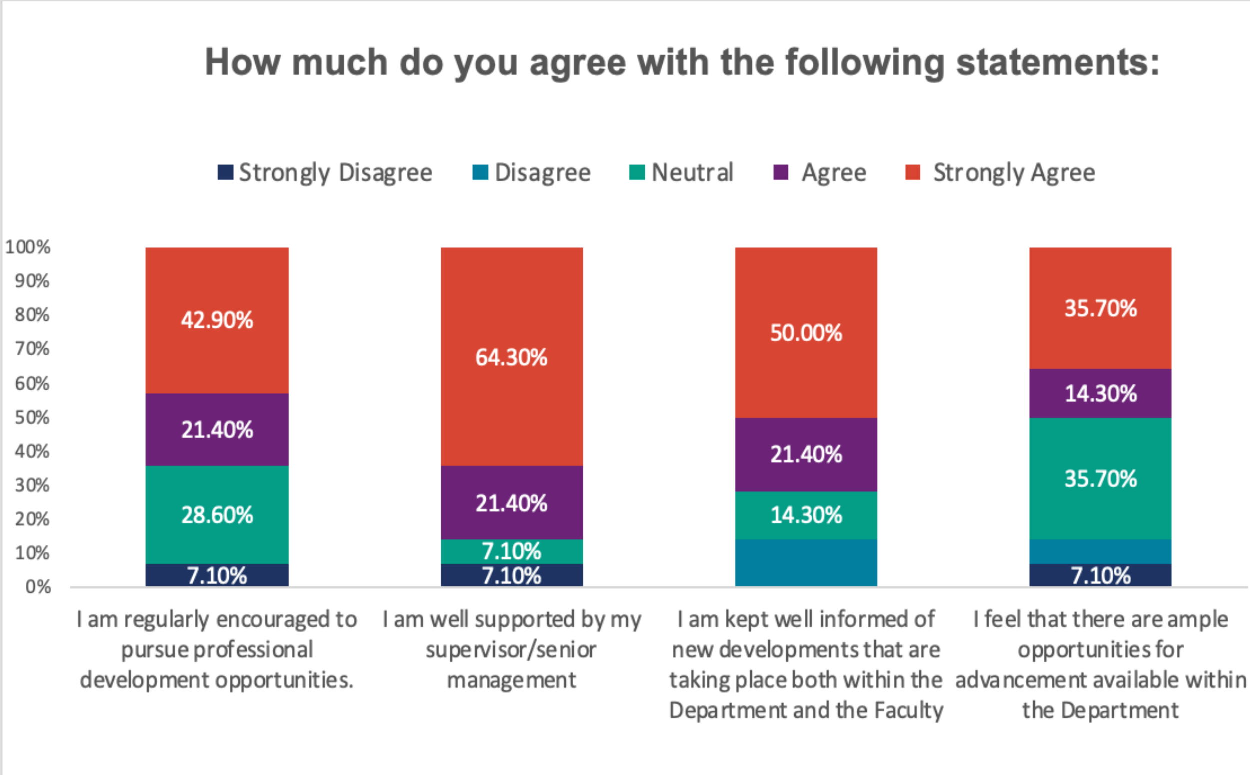
WORKPLACE EXPERIENCE:



Is there any further comment you would like to make about your workplace experience?

- As my previous comment, Engineering so far has been my most positive experience working at the University.
- More team building events or meetings for staff only.
- This is a very collaborative department so no issues there, but my role involves two distinct cycles that most people aren't part of at the same time. Undergraduate recruitment and admissions has its own timelines, graduate has its own, and sometimes they collide. I am not sure what can be done about it, but it does mean that sometimes I have more to do than can be done, even with a bit of overtime. Also, the introduction of Slate has measurably increased the time spent simply on providing an offer of admission, changing programs, processing conditions which has mean less time for other parts of my job.

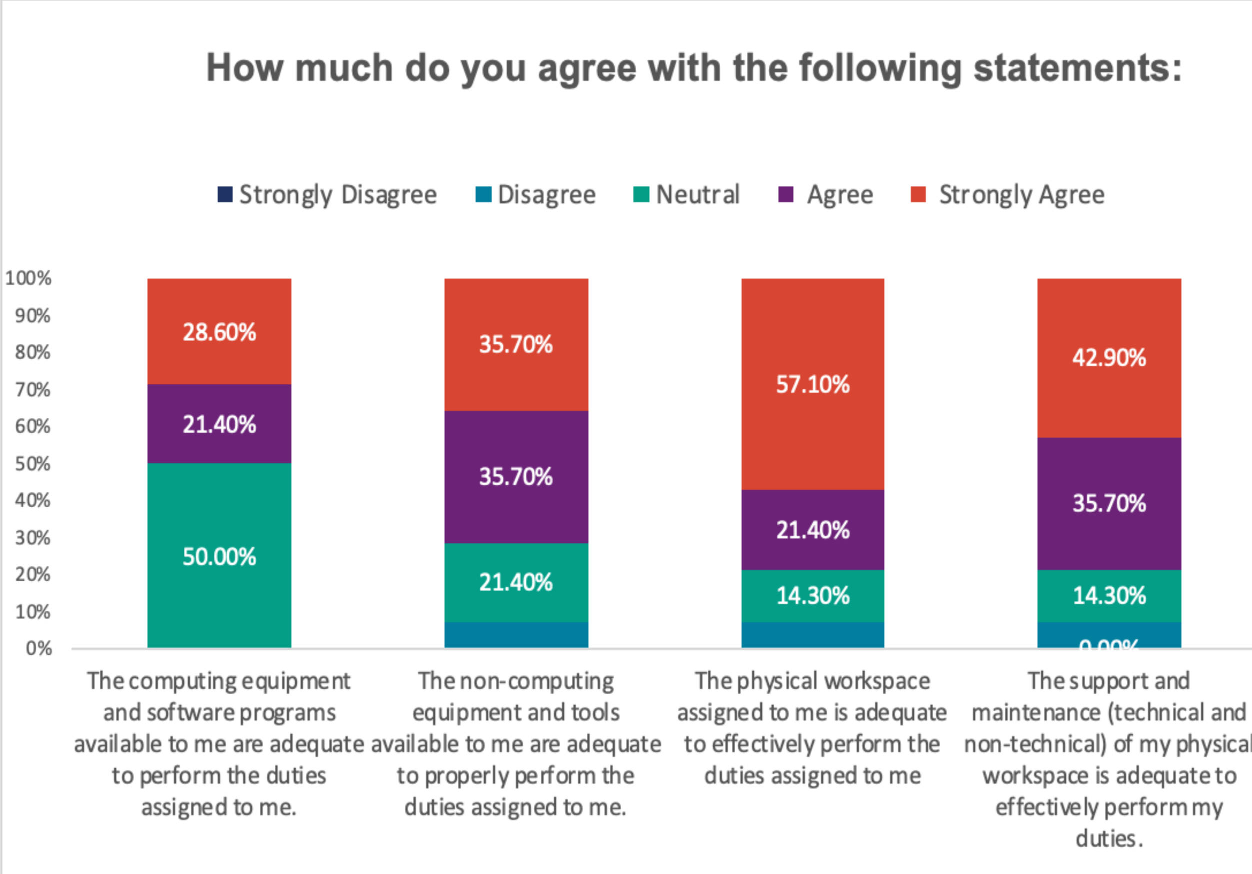
PROFESSIONAL DEVELOPMENT:



Is there any further comment you would like to make about professional development?

- For the last question I would answer "not applicable" if it was an option.
- Would like to see a budget for joining IT conferences and continuing education to sharpen skills.
- While nobody actively tells me to participate in professional development opportunities, I do seek the out and am encouraged to participate in those that I find. I feel like there is a large disconnect on the graduate side of things. In undergrad I am included in meetings to discuss and share ideas on improving recruitment, admissions, especially around equity issues. On the grad side, I tend to hear off-hand about initiatives from SGS. We do not have the same information and involvement in grad as we do in undergrad, which is unfortunate.

FACILITIES:



Is there any further comment you would like to make about your workspace?

- We would benefit from an administrative system for tracking graduate student progress like Degree Explorer. This is outside the control of the Department, I understand.

- I'm involved with the upkeep of computing equipment for the Department. I have been struggling to rebuild all systems up to a stable and reliable level, starting with the infrastructure, to support new services like VoIP and better internet connections. There is still more upgrading to do, but the next phase should be user end. The PC's most are working on are eight to 10 years old. Computers are replaced as they break down with other refurbished PCs we collect from other departments. An increase in our annual budget put towards our classroom teaching facilities and staff equipment.

- Desks and chairs need to be improved within the Department. Ergonomic seating and desks - Computers are recycled from ECF labs; Staff are upgraded with this older equipment and as technology changes frequently, the older computers do not have the computing power to process things making it inadequate for staff to work properly. One team has to lug a Mac laptop computer back and forth to work on a simple photoshop task.

- I have a visual impairment, so things like the version of Outlook greatly affects the accessibility of software and systems. I work from home for the most part and have set up my laptop quite well, but my desktop in the office will need updating (or downgrading?). The University doesn't provide reasonable service or help when trying to adjust. Health and Wellness doesn't have the resources or bandwidth to, so that leaves staff very much on their own. New systems (such as Slate) aren't always designed with accessibility in mind. I am sure most of the U of T website is not AODA compliant.

This is a broad issue at the University, but I think we should be phasing this into our website, documents (PDFs are notorious for being non-compliant without actively adding features). During onboarding, information on where accessible washrooms, entrances are, which classrooms and meeting rooms are better for accessibility would be helpful.

- The majority of documents are either in personal drive or emails. If we have all documents in either SharePoint or OneDrive, so everyone could access them regardless of VPN access, that will increase efficiency within the units of the Department.

Appendix: A.10 2018-19 Final Assessment Report and Implementation Plan: Civil and Mineral Engineering

UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING

February 20, 2019

Professor Susan McCahan
Vice-Provost, Academic Programs
University of Toronto

Dear Professor McCahan

I write in response to your letter of August 7, 2018 regarding the March 14-15, 2018 external review of the recently-renamed Department of Civil and Mineral Engineering and its undergraduate and graduate programs.

The external review process is a valuable exercise that affords us the opportunity to take stock of the state of our academic units and of the Faculty as a whole. We are extremely pleased with the reviewers' positive assessment of the overall strength of the department, particularly the excellent quality and diversity of our students and faculty, highly-regarded undergraduate and graduate programs, and increased research funding.

Below I address the issues raised by the reviewers and outlined in your request for an administrative response.

Administration

1. The reviewers indicated there is a need for an overarching departmental strategic plan, which may include an overall mission statement, address undergraduate and doctoral enrolment, and identify international peer institutions.

The Department has embarked on consultative processes with stakeholders to develop an overarching departmental strategic plan. The strategic plan, building on outcomes of the self-study and external review report, will be consistent with the Faculty of Applied Science and Engineering (FASE) *2017-2022 Academic Plan* and *Implementation Plan*, the *University of Toronto Strategic Research Plan* and the *Three Priorities of the University*. The Department has established a Strategic Planning Working Group, consisting of the Chair, four Associate Chairs, and two Directors from the Department.

Immediate-term goals (within six months)

- Develop terms of reference for the Strategic Planning Working Group
- Consult with Department stakeholders (faculty, staff, students, alumni, Industrial Advisory Board)
- Conduct a Department retreat (June 2019)
- Survey best practices of international peer institutions

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Mid-term goals (within one to two years)

- Complete the draft strategic plan and circulate it for feedback (July 2019)
- Finalize the strategic plan (September 2019)

Long-term goals (within three to five years)

- Review progress made towards the strategic plan's goals, adjust priorities to ensure continued progress, and refine objectives

2. The reviewers identified variances in the quality and quantity of space available to faculty and students and in communication about decisions regarding space. The reviewers recommended establishing a "Space Committee" to establish a strategic space plan and to seek ways to improve communications surrounding space decisions.

Since 2012, nine new faculty members have joined the Department and one faculty member has retired. The number of PhD students has increased from 96 to 110 and the number of post-doctoral fellows and research associates has also grown. This has placed tremendous pressure on office space. Demands for research space have also grown with more faculty, more students, and increases in research funding. Over this period the Department has invested approximately $7M in lab and office space renovations in the Galbraith and Lassonde Mining buildings and has acquired additional research and graduate student office space. This has included an additional 60 office spaces for graduate students in the Galbraith and Lassonde Mining buildings. The Student Services team has moved to space recently acquired from the FASE, providing space for the expanded IT and Infrastructure personnel in the Department. A number of graduate student offices have been updated with new furniture and been repainted. Renovations with SIF funding have refurbished or created research space in the areas of mining and environment, low impact development, geotechnical engineering, and concrete materials. During the renovation period in 2017 and 2018 there was significant disruption of research programs. In May 2019, the Department will acquire additional office space from the FASE.

Through a consultative process, the Department developed a space policy in 2015. The allocation of graduate student office space is overseen by a Space Management Committee comprised of the four Section Coordinators in the Department with support from the Department Infrastructure Assistant. While within its mandate, this Committee has not been involved in allocation or reallocation of research space. With new faculty members and research programs of more junior faculty members expanding at different rates, there is a need to review the allocation and effectiveness of the current research space distribution within the Department. This review will be led by the new Director of Technical Services (hired in January 2019) with a newly constituted space committee focused on both research lab and graduate student office space allocation. This committee will engage relevant stakeholders in any consideration of space allocations and report any deliberations and decisions on space allocations at Departmental Council meetings.

Immediate-term goals (within six months)

- Hire Director of Technical Services (completed January 2019)
- Review and revise the mandate of the Department Space Committee
- Review the quality and quantity of graduate student office space
- Review the needs for and allocation of research space

Mid-term goals (within one to two years)

- Follow up on space reviews to optimize office and research space usage, prioritizing needs of junior faculty
- Develop a plan for the renewal of office and research space
- Work with Advancement to identify philanthropic opportunities for research space renewal

Long-term goals (within three to five years)

- Conduct regular reviews of space needs, allocation and usage, and communicate the outcomes
- Continue to work with Advancement in seeking funding for space renewal and new space needs

3. The reviewers encouraged the Department to formalize administrative processes and to improve communications surrounding staff job expectations and performance review. They also recommended conducting a review of needs, gaps, and workload within the staffing structure, especially in the areas of IT and lab support staff.

Performance reviews for USW staff, Research Associates, and Professional Managers are conducted following the administrative processes set out in the University of Toronto policies and collective agreements. Job descriptions of a number of Departmental staff have been reviewed and updated as needs and expectations changed.

The Department's 2018 Self-Study identified a number of needs, gaps and workload issues within the staffing structure. Since the external review, two additional people have been hired in the Department Business Office. An additional position will be created to provide greater support to faculty members in managing the finances and contracting associated with large government and industry funded research projects. This position should be filled by April 2019.

A new Director of Technical Services was hired in January 2019. This person oversees all technical staff in the Department and is also responsible for health and safety and management of space and research and teaching infrastructure in the Department. A new position, Departmental Assistant, has been created and will be filled by March 2019. This person will report to the Director of Technical Services and assist with management of space and infrastructure and scheduling of IT support.

A new Computer Network Manager was hired after completing a year-long search and engagement of an external search agency. This person works with the Department Computer Assistant. A summer IT assistant was also hired and we will be engaging a work study student to assist with IT. With a pending retirement, we anticipate hiring a new Computer Assistant in 2019. The Department also supports the sharing of IT resources across the FASE, as per recommendations of the FASE IT Taskforce.

With respect to lab support, the Department has the following support staff:

- Three full-time technical staff supporting the Structural Test Facility and research and teaching in the structures and concrete materials area
- One full-time machinist supporting research and teaching needs across the Department
- One full-time laboratory technician supporting undergraduate and graduate teaching for environmental courses and monitoring safety in the environmental research labs
- One full-time technician supporting teaching and research in the geotechnical and geomechanics areas

At present, cost recovery from the technical staff for work associated with research projects accounts for approximately 40% of the salary and benefit costs.

Regular town hall meetings with staff were initiated in August 2018.

Immediate-term goals (within six months)

- Continue to maintain regular communications with staff through town halls
- Review current workloads and identify possibilities for efficiencies and needs for additional positions
- Create a Business Office position associated with research support

Mid-term goals (within one to two years)

- Continue to maintain regular communications with staff through town halls
- Review workloads and job descriptions and allocations of duties on an annual basis
- Anticipate changes in staff workloads
- Develop on-boarding materials for new staff

Long-term goals (within three to five years)

- Continue to evaluate Department needs, staffing, and workloads

Faculty

4. The reviewers noted gaps in mentorship and feedback surrounding faculty promotion. The reviewers recommended improving the documentation and communications for tenure expectations, and prioritizing untenured faculty space, resources and feedback.

Mentors are assigned to new faculty members when they join the Department. Mentors are asked to provide a yearly update to the Chair on their mentoring activities. A teaching mentor is also hired for all new faculty members to provide guidance through their first teaching assignment. The Department Chair meets annually with all assistant professors to review and discuss assessments conducted by the Department PTR Committee. When possible, a junior faculty member is invited to be a member of the PTR Committee each year. Research proposals of junior faculty are reviewed by the Associate Chair of Research in the Department.

As per University policy, probationary reviews for assistant professors are held in their fourth year at the University and the recommendations of the Probationary Review Committee are communicated to these professors by the Department Chair.

Immediate-term goals (within six months)

- Chair will meet with junior faculty to discuss promotions policies and expectations
- Chair will continue meeting with junior faculty as part of the annual PTR assessment

Mid-term goals (within one year)

- Develop on-boarding materials for new faculty
- Ensure junior faculty space and resource needs are prioritized and met within the Department constraints on space and resources
- Chair will continue to meet regularly with junior faculty, including meetings to discuss PTR assessments
- Continue to have junior faculty on the Department PTR Committee

Long-term goals (within two to five years)

- Continue to ensure junior faculty space and resource needs are prioritized and met within the Department constraints on space and resources
- Chair will continue to meet regularly with junior faculty
- Continue to have junior faculty on the Department PTR Committee

Undergraduate Programs

5. As part of the strategic plan, the reviewers recommended conducting a curriculum review to identify curricular overlap and to address student workload.

The Civil Engineering and Lassonde Mineral Engineering programs are undergoing review by the Canadian Engineering Accreditation Board (CEAB), with accreditation decisions expected in June 2019. Preparation for the October 2018 visit required curriculum mapping and explicit identification of learning outcomes for courses in these programs. Through this process, action items related to current curricula were identified. The goals listed below are consistent with the CEAB requirement for a continuous curriculum improvement process.

Immediate-term goals (within six months)

- Hold town halls with students to collect feedback on the current curricula
- Establish committees to map out a plan for curriculum review. These committees will report to the Department Undergraduate Studies Committee
- Address any concerns raised by the CEAB

Mid-term goals (within one to two years)

- Identify any curricular overlap and student workload issues
- Identify new opportunities and directions in the relevant professions (e.g. data science in civil and mineral engineering professions)
- Complete curriculum review and pass it through the FASE governance process

Long-term goals (within three to five years)

- Review curriculum and CEAB graduate attributes in the continual improvement process on an ongoing basis
- Review curriculum to ensure its relevancy regarding current directions in the engineering profession

6. The reviewers encouraged continuing to recruit students from traditionally underrepresented groups.

The 2018 first year Civil Engineering class is 44% women and 32% of the class are international students. The first year Lassonde Mineral Engineering class is 23% women and 10% of the class are international students. The second year Civil Engineering class is 50% women. We will continue efforts to maintain this level of gender diversity in the Civil Engineering program and increase the level of gender diversity in the Lassonde Mineral Engineering program through participation in FASE recruitment events, our annual Top Applicant Event, and other activities such as the Women in Mining events.

We will also work with the FASE to increase representation from Indigenous, Black, and other communities underrepresented in the Department's graduate and undergraduate programs. We will consider the recommendations from the Eagles Longhouse Blueprint for Action report and participate in Black Inclusivity Initiatives led by the FASE.

Immediate-term goals (within six months)

- Continue our successful efforts in increasing gender diversity in our graduate and undergraduate programs
- Work with the FASE to increase representation from Indigenous, Black and other underrepresented communities
- Participate in FASE outreach and programming efforts to strengthen relationships with underrepresented communities

Mid-term and long-term goals (within one to five years)

- Maintain efforts to increase gender diversity and representation from Indigenous, Black and other underrepresented communities
- Identify opportunities to incorporate indigenous content into the CIV and LME curriculum

Graduate Programs

7. The reviewers suggested reviewing the promotion and enrollment for the MEng in Cities Engineering and Management, and evaluating the overall future direction for the program.

The MEng in Cities Engineering and Management (MEngCEM) was launched in September 2013. The 16-month full-time program will continue the trend towards broadening engineering education and cross traditional engineering disciplines to focus on the application domain of cities. The program is structured around three themes: Theme A: infrastructure-related courses that focus on quantitative methods to provide a foundation for evidence-based decision making; Theme B: cities as complex systems that influence decision making; and Theme C: an integrative practicum that allows students to apply the technical knowledge they have learned to a complex problem related to cities.

To date, enrolment in the MEngCEM has remained relatively small. In the 2018-2019 academic year, there were 47 applications to the program. From these applications, 19 students were offered admission and 10 students accepted the offers. While the program is given significant exposure on the Department website, it is clear that additional efforts are needed to increase enrolment. An initiative is underway to create a mentorship program for MEngCEM students with the City of Toronto and the City of Oshawa has expressed interest in providing practicum placements.

Immediate-term goals (within six months)

- Survey past graduates on impact of the program on their careers, advice for revision of program structure and program curriculum
- Appoint a director

- Form an advisory group
- Review the program's curriculum
- Pursue internship possibilities with City of Oshawa and interested companies (e.g. WSP, PCL Construction)

Mid-term goals (within one to two years)

- Evaluate the impact of the immediate-term actions

Long-term goals (within three years)

- Assess whether to close the program

Research

8. The reviewers encouraged expanding the Department's research portfolio by exploring more industry-sponsored research for students; identifying ways to support undergraduate research engagement; and, supporting growth in cross-departmental research.

In 2016, 9.4% of the Department's $8.5M in research funding was derived from industry sources. Over the past five years, graduate and undergraduate students in the Department have been involved in research supported by funding from 63 companies. Students have participated in industrial internships through the NSERC Industrial Postgraduate Scholarship Program, the Mitacs Accelerate Program, and NSERC Collaborative Research and Training Experience Programs.

Each summer, undergraduate students work in the Department with various research groups, particularly in research labs. Some students are supported by NSERC Undergraduate Summer Assistantships and from the research funds of faculty members.

As of January 2019, the Department has four budgetary faculty cross-appointments with other units in the Faculty. In addition to these cross-appointments, many faculty in the Department actively collaborate on research projects across the FASE and beyond. A number of the projects are supported by funding from the FASE and the Department (six XSeed projects for example, each supported by $15K/yr. from the Department). Faculty members in the Department are involved in several extra-departmental institutes including the Institute for Water Innovation, the University of Toronto Transportation Institute, the Institute for Sustainable Energy, and the Lassonde Institute of Mining. Cross-departmental and cross-faculty research has been supported by various NSERC programs (e.g. Strategic Project Grants, Collaborate Research and Training Experience Program), the Ontario Research Fund Research Excellence program, and by industry funding. We are creating a new position in the Department Business Office to support faculty who manage large and complex cross-departmental and interdisciplinary research projects.

Immediate-term goals (within six months)

- Create and fill new Business Office position associated with research support
- Ensure undergraduate students are aware of research-related summer employment in the Department
- Continue to work with the FASE Director of Corporate and Foundation Partnerships to pursue industry funding for departmental and cross-departmental research
- Continue to engage the Department Industrial Advisory Board and the Lassonde Advisory Board

Mid-term and long-term goals (over the next five years)

- Continue outreach to industry for support of departmental and cross-departmental research projects
- Explore funding to increase the engagement of undergraduates in research

Relationships

9. The reviewers suggested increasing alumni and external engagement in advisory boards and improving outreach activities to these groups.

The Department supports the Engineering CONNECT alumni platform with more than 1,000 alumni signed up to CONNECT. The Department is working with FASE Advancement to increase alumni engagement.

Immediate-term goals (within six months)

- Expand the Industrial Advisory Board (IAB) by two members
- Hire Communications and Event Assistant
- Continue to encourage sign-ups to CONNECT
- Hold Skule™ Lunch and Learn sessions on topics relevant to the Department, with targeted invitations
- Begin Gull CAMP bunkhouse construction ($3.2M project approved by the Capital Projects and Space Allocation Committee in February 2019)

Mid-term goals (within one to two years)

- Continue to expand the Department Industry Advisory Board (IAB) to 10 – 12 members, focussing on diversity
- Identify candidates for FASE alumni awards
- Work with Advancement to develop annual plans for alumni engagement events

Long-term goals (within three to five years)

- Renew IAB (members have initial three-year term) and further expand it to 15 members, focussing on diversity
- Form IAB subcommittees to focus on various Department priorities

The next review of the Department of Civil and Mineral Engineering and its programs is scheduled for the 2022-2023 academic year. In the interim, the chair of the department, Professor Brent Sleep, will report to the Dean on progress made toward the implementation of recommendations on an annual basis, and the Dean will submit a report to you in the 2020-2021 academic year, midway between the March 2018 review and the next site visit.

I confirm that Professor Sleep and I will attend the April 2, 2019 AP&P meeting, where this review will be discussed.

Thank you for the opportunity to respond to the report of the external review team. Their comments and recommendations have helped sharpen the vision and future priorities for the Department of Civil & Mineral Engineering.

Sincerely

Cristina Amon
Dean

cc:

Justine Garrett, Coordinator, Academic Planning and Reviews
Professor Heather MacLean, Acting Chair, Department of Civil and Mineral Engineering
Daniella Mallinick, Director, Academic Programs, Planning and Quality Assurance
Professor Brent Sleep, Chair, Department of Civil and Mineral Engineering
Caroline Ziegler, FASE Governance and Programs Officer

Academic Programs - Undergraduate

Appendix: B.1 Civil Engineering Program Curriculum, 2022-23

FIRST YEAR CIVIL ENGINEERING

Fall Session – Year 1

APS100H1: Orientation to Engineering
APS110H1: Engineering Chemistry and Materials Science
APS111H1: Engineering Strategies & Practice I
CIV100H1: Mechanics
MAT186H1: Calculus I
MAT188H1: Linear Algebra F 3 1 1 0.50

Winter Session – Year 1

APS106H1: Fundamentals of Computer Programming
APS112H1: Engineering Strategies & Practice II
CHE112H1: Physical Chemistry
CIV185H1: Earth Systems Science
CIV191H1: Introduction to Civil Engineering
MAT187H1: Calculus II

Approved Course Substitutions

1. Students are able to substitute MAT186H1 with the online calculus course APS162H1.
2. Students are able to substitute MAT187H1 with the online calculus course APS163H1.
3. Students are able to substitute APS110H1 with the online course APS164H1.
4. Students are able to substitute CIV100H1 with the online course APS160H1.

CIV201 - INTRODUCTION TO CIVIL ENGINEERING

CIV201 is a three-day field-based course. The course will be held on the Tuesday, immediately after Labour Day. Students are required to bring and wear their Personal Protective Equipment (PPE). The results of this course are used in computing the student's Second Year Fall Session average. An extra fee is charged to cover a transportation and accommodation.

CS/HSS REQUIREMENT

Students are required to complete 4 half-courses of CS/HSS, at least two of which must be HSS, before graduation. The second-year core course APS301H1 - Technology in Society and the Biosphere I, counts as one half-course (0.50) towards an HSS requirement. Note that valid HSS courses are more restrictive in scope than are CS courses. A list of pre-approved CS and HSS courses can be found on the Faculty of Engineering's Registrar's Office website.

PRACTICAL EXPERIENCE REQUIREMENT

Students are required to have completed a total of 600 hours of acceptable practical experience before graduation (normally during their summer vacation periods). Satisfactory completion of CME358H1 - Survey Camp (Civil and Mineral Practicals), will contribute 100 hours towards this requirement. Satisfactory completion of the Professional Experience Year (PEY) will also completely fulfill the Practical Experience Requirement.

SECOND YEAR CIVIL ENGINEERING

Fall Session – Year 2

CIV201H1: Introduction to Civil Engineering
CIV220H1: Urban Engineering Ecology
CIV235H1: Civil Engineering Graphics
CIV280H1: Management of Construction
CIV282H1: Engineering Communications I
CME210H1: Solid Mechanics I
CME261H1: Engineering Mathematics I
CME270H1: Fluid Mechanics I

Winter Session – Year 2

CIV209H1: Civil Engineering Materials
CIV214H1: Structural Analysis I
CIV250H1: Hydraulics and Hydrology
CME259H1: Technology in Society and the Biosphere I
CME263H1: Probability Theory for Civil and Mineral Engineers
CME262H1: Engineering Mathematics II

CME358H1 - Survey Camp (Civil and Mineral Practicals), is a two-week field-based course taken in the month prior to starting Third Year. The results of this course are used in computing the student's Third Year Fall Session Average. An extra fee is charged to cover part of the costs of food and accommodation.

THIRD YEAR CIVIL ENGINEERING

Fall Session – Year 3

CIV312H1: Steel and Timber Design
CIV331H1: Transport I - Introduction to Urban Transportation Systems
CIV342H1: Water and Wastewater Treatment Processes
CIV375H1: Building Science
CIV382Y1: Civil Engineering Communication Portfolio
CME321H1: Geotechnical Engineering I
CME358H1: Survey CAMP (Civil and Mineral Practicals)
CME368H1: Engineering Economics and Decision-Making

Winter Session – Year 3

CIV313H1: Reinforced Concrete I
CIV324H1: Geotechnical Engineering II
CIV332H1: Transport II - Performance
CIV340H1: Municipal Engineering
CIV380H1: Sustainable Energy Systems
CIV382Y1: Civil Engineering Communication Portfolio
CS/HSS Elective

PROFESSIONAL EXPERIENCE YEAR

Students registered within this program, and all other undergraduate programs within the Faculty of Applied Science and Engineering, may elect to enrol and participate in the Professional Experience Year (PEY) program. The PEY program requires that qualified students undertake a paid, full-time 12-16 month continuous work period with a cooperating company. Details are described in the beginning of this chapter. For more information, consult the Professional Experience Year Office, 222 College Street, Suite 106 early in session 2F or 3F.

JEFFREY SKOLL BASC/MBA PROGRAM

The Jeffrey Skoll Combined BASc/MBA Program allows qualified and selected students in the Faculty of Applied Science and Engineering to complete both a BASc and an MBA in a reduced time. Students will be admitted to the program prior to entering their fourth year of studies in the BASc program. Interested students should contact the Rotman School of Management.

MINORS AND CERTIFICATE PROGRAMS

Several Engineering Minors and Certificate Programs are available and generally require the student to successfully complete a carefully selected slate of electives in their Fourth Year. Late in the Third Year Winter Session, students use an online pre-registration tool to indicate their preferred fourth-year electives. Students should review the various minor and certificate program requirements and attend the department's information sessions in Third Year to ensure that the appropriate electives are taken in Fourth Year. Students should note that they can also complete the requirements of a minor or certificate program even after they have graduated, as long as the additional requirements are met within nine years of their initial registration in the BASc program. If completed after graduation, additional fees will be assessed. A transcript will be issued with the amended courses and indication of completed minor or certificate program requirements.

FOURTH YEAR CIVIL ENGINEERING

Fall Session – Year 4

Free Elective
Free Elective
CS/HSS Elective

Choose two technical electives from the following list:

CHE353H1: Engineering Biology
CIV300H1: Terrestrial Energy Systems
CIV416H1: Reinforced Concrete II
CIV420H1: Construction Engineering
CIV477H1: Special Studies in Civil Engineering
CME499Y1: Individual Project Y *
CME499H1: Individual Project F *
CME525H1: Tunneling and Urban Excavation
CME538H1: Introduction to Data Science for Civil and Mineral Engineers
CIV514H1: Concrete Technology
CIV515H1: Introduction to Structural Dynamics
CIV517H1: Prestressed Concrete
CIV519H1: Structural Analysis II
CIV521H1: Rock Mechanics
CIV531H1: Transport Planning
CIV536H1: Urban Activity, Air Pollution, and Health
CIV541H1: Environmental Biotechnology
CIV550H1: Water Resources Engineering
CME538H1: Introduction to Data Science for Civil and Mineral Engineers
CME549H1: Groundwater Flow and Contamination
MIN511H1: Integrated Mine Waste Engineering
MIN520H1: Mine Optimization

* Students may take either a half credit CME499 OR a full year credit CME499 but not both.

Winter Session - Year 4

CIV498H1: Group Design Project
Free Elective S/Y
CS/HSS Elective S/Y

Choose two technical electives from the following list:

CHE354H1: Cellular and Molecular Biology
CIV300H1: Terrestrial Energy Systems
CIV440H1: Environmental Impact and Risk Assessment
CIV477H1: Special Studies in Civil Engineering
CME499Y1: Individual Project Y *
CME499H1: Individual Project S *

CIV510H1: Solid Mechanics II
CIV516H1: Public Transit Operations and Planning
CIV518H1: Behaviour and Design of Steel Structures
CIV523H1: Geotechnical Design
CIV576H1: Sustainable Buildings
CIV577H1: Infrastructure for Sustainable Cities
CIV578H1: Design of Building Enclosures
CIV580H1: Engineering and Management of Large Projects
CME500H1: Fundamentals of Acid Rock Drainage
BME331H1: Physiological Control Systems
MIN330H1: Mining Environmental Management
MIN470H1: Ventilation and Occupational Health

* Students may take either a half credit CME499 OR a full year credit CME499 but not both.

OTHER ELECTIVE COURSES

Elective courses in addition to those listed above may be considered based on the following general guidelines. Students wishing to take elective courses from other departments need to ensure that they have the appropriate background and prerequisites. Students with an overall average of 75% or greater in their third year may take up to two graduate level (1000-series) courses, depending upon availability. In all cases the interested student should consult with the Civil Engineering Office of Student Services (GB116) to obtain further information and the appropriate permission.

Appendix: B.2 Lassonde Mineral Engineering Program Curriculum, 2022-23

FIRST YEAR MINERAL ENGINEERING

Fall Session – Year 1

APS100H1: Orientation to Engineering
APS110H1: Engineering Chemistry and Materials Science
APS111H1: Engineering Strategies & Practice I
CIV100H1: Mechanics
MAT186H1: Calculus I
MAT188H1: Linear Algebra

Winter Session – Year 1

APS106H1: Fundamentals of Computer Programming
APS112H1: Engineering Strategies & Practice II
CHE112H1: Physical Chemistry
MAT187H1: Calculus II
MIN120H1: Insight into Mineral Engineering
MIN191H1: Introduction to Mineral Engineering

Approved Course Substitutions

1. Students are able to substitute MAT186H1 with the online calculus course APS162H1.
2. Students are able to substitute MAT187H1 with the online calculus course APS163H1.
3. Students are able to substitute APS110H1 with the online course APS164H1.
4. Students are able to substitute CIV100H1 with the online course APS160H1.

SECOND YEAR MINERAL ENGINEERING

Fall Session – Year 2

CME210H1: Solid Mechanics I
CME261H1: Engineering Mathematics I
CME270H1: Fluid Mechanics I
ESS262H1: Earth Systems Processes
MSE202H1: Thermodynamics I

Winter Session – Year 2

CME259H1: Technology in Society and the Biosphere I
CME262H1: Engineering Mathematics II
CME263H1: Probability Theory for Civil and Mineral Engineers
ESS224H1: Introduction to Mineralogy and Petrology
MIN250H1: Surface Mining

THIRD YEAR MINERAL ENGINEERING

Fall Session – Year 3

CME321H1: Geotechnical Engineering I
CME358H1: Survey CAMP (Civil and Mineral Practicals)
CME368H1: Engineering Economics and Decision-Making
ESS241H1: Geologic Structures and Maps
MIN301H1: Mineral Reserve and Mineral Resource Estimation
MIN329H1: Engineering Rock Mechanics

Winter Session – Year 3

MIN320H1: Explosives and Fragmentation in Mining
MIN330H1: Mining Environmental Management
MIN351H1: Underground Mining
MIN450H1: Mineral Economics
MSE301H1: Mineral Processing
CS/HSS Elective

*CME358H1 – Survey CAMP (Civil and Mineral Practicals) is a two-week field-based course taken in the month prior to starting Third Year. The results of this course are used in computing the student's Third Year Fall Session Average. An extra fee is charged to cover part of the costs of food and accommodation.

*In order to graduate, students must obtain credits in the equivalent of at least four half-year Complementary Studies/Humanities and Social Sciences (CS/HSS) Electives. Of these Electives, the equivalent of at least two half-year credits must be Humanities and Social Sciences. Refer to the Registrar's Office website for a list of pre-approved CS/HSS Electives.

FOURTH YEAR MINERAL ENGINEERING

Fall Session – Year 4

MIN400H1: Geology Field Camp for Engineers
MIN450H1: Mineral Economics
MIN466H1: Mineral Project Design I
MIN565H1: Design and Support of Underground Mine Excavations
CS/HSS Elective (see note)

Choose two of the following Technical Electives:

CHE565H1: Aqueous Process Engineering
CIV420H1: Construction Engineering
CME499H1: Individual Project F
CME499Y1: Individual Project Y
CME538H1: Introduction to Data Science for Civil and Mineral Engineers
CME549H1: Groundwater Flow and Contamination

CME525H1: Tunneling and Urban Excavation
ESS452H1: Geophysical Imaging with Non-seismic Methods
JGA305H1: Environmental and Archaeological Geophysics
MIN511H1: Integrated Mine Waste Engineering

Winter Session – Year 4

MIN467H1: Mineral Project Design II
MIN470H1: Ventilation and Occupational Health
CS/HSS Elective (see note)

Choose one of the following Technical Electives:

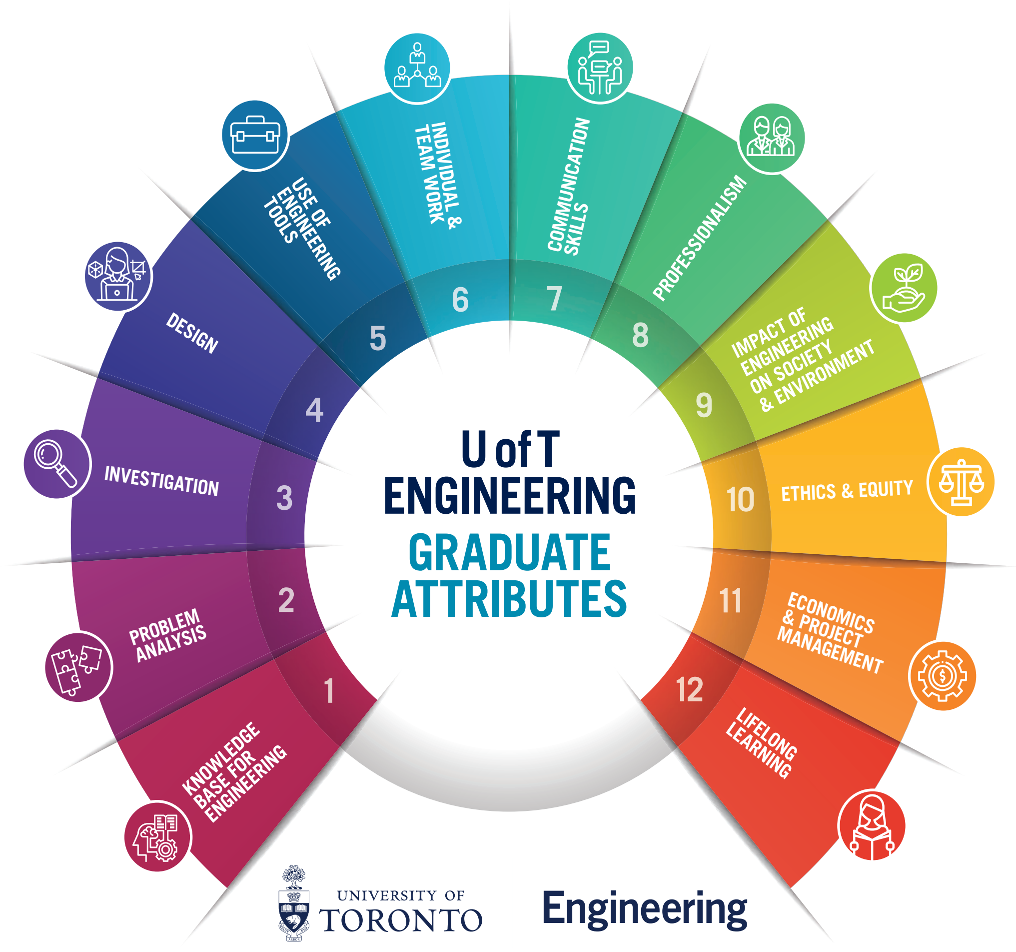
APS502H1: Financial Engineering
CIV300H1: Terrestrial Energy Systems
CIV324H1: Geotechnical Engineering II
CIV440H1: Environmental Impact and Risk Assessment
CIV523H1: Geotechnical Design
CIV578H1: Design of Building Enclosures
CIV580H1: Engineering and Management of Large Projects
CME499H1: Individual Project S
CME499Y1: Individual Project Y
CME500H1: Fundamentals of Acid Rock Drainage
ESS331H1: Sedimentation and Stratigraphy
ESS423H1: Mineral Deposits
MIN520H1: Mine Optimization

*MIN400H1 – Geology Camp is taken in the week prior to fall term of fourth year. The results of this are used in computing the student's fourth year fall session average. An extra fee is charged to cover cost of room, board and travel.

*Note. In Year 4 students are required to select 2 CS/HSS electives and 3 technical electives. These courses may be taken in either term subject to maintaining the minimum required course load.

*Note: Technical Electives outside of the group of courses listed must be approved in advance. Students wishing to take elective courses from other departments need to ensure that they have the appropriate background and prerequisites. Students with an overall average of 75% or greater in their third year may take up to two graduate level (1000-series) courses, depending upon availability. In all cases the interested student should consult with the Department's Office of Student Services (GB116) to obtain further information and the appropriate permission.

Appendix: B.3 Canadian Engineering Accreditation Board Graduate Attributes



1 KNOWLEDGE BASE FOR ENGINEERING

- Demonstrate competence in mathematics and modeling
- Understand the natural sciences and engineering fundamentals
- Possess specialized engineering knowledge appropriate to the program

2 PROBLEM ANALYSIS

- Identify and characterize an engineering problem
- Formulate a solution plan (methodology) for an engineering problem
- Formulate and interpret a model
- Execute solution process for an engineering problem

3 INVESTIGATION

- Define a problem
- Devise and execute a plan to solve a problem
- Use critical analysis to reach valid conclusions supported by the results of the plan

4 DESIGN

- Frame a complex, open-ended problem in engineering terms
- Generate a diverse set of candidate engineering design solutions
- Select candidate engineering design solutions for further development
- Advance an engineering design to a defined end state

5 USE OF ENGINEERING TOOLS

- Use fundamental modern techniques, resources and engineering tools
- Use discipline-specific techniques, resources and engineering tools
- Recognize limitations of the tools used

6 INDIVIDUAL & TEAM WORK

- Establish and monitor team organizational structure
- Promote team effectiveness through individual action
- Be successful in a team-based project

7 COMMUNICATION SKILLS

- Identify and credibly communicate engineering knowledge
- Use different modes of communication
- Develop communication through an iterative process

8 PROFESSIONALISM

- Describe engineering roles in a broader context (pertaining to the environment, health, safety and public welfare)
- Recognize the impact of engineering within global society (the broader public interest)
- Behave in a professional manner

9 IMPACT OF ENGINEERING ON SOCIETY & ENVIRONMENT

- Understand relationships among technology and the social, cultural, economic and environmental conditions of society—both locally and globally, and in the short- and long-term
- Identify and choose alternative ways to mitigate or prevent adverse social, environmental, health and safety impacts
- Demonstrate awareness of legal issues relevant to an engineering activity

10 ETHICS & EQUITY

- Recognize ethical and equity-based dilemmas
- Apply the Code of Ethics and equity principles
- Act ethically and demonstrate individual accountability

11 ECONOMICS & PROJECT MANAGEMENT

- Estimate the life-cycle economic and financial costs and benefits for relevant engineering activities
- Evaluate the economic and financial performance of an engineering activity and compare alternative proposals on the basis of these measures
- Read and understand financial statements for engineering activities
- Plan and manage engineering activities to be within time and budget constraints

12 LIFELONG LEARNING

- Independently summarize, analyze, synthesize and evaluate information from a wide variety of sources
- Develop a strategy to identify and address gaps in knowledge

TO LEARN MORE, VISIT uoft.me/GraduateAttributes

Appendix: B.4 National Survey of Student Engagement (NSSE) Results for Department of Civil Engineering (2022) Survey

National Survey of Student Engagement (NSSE) Results for
Department of Civil & Mineral Engineering (CIVIL)

The NSSE questionnaire categorizes selected questions into four major themes and 10 Engagement
Each **Engagement Indicator (EI)** is a summary measure based on sets of NSSE questions examining key dimensions of students engagement. The ten indicators are organized within four themes. Each Engagement Indicator groups the responses from the questions in its respective category, rescales them from 0 to 60 (e.g., Never=0; Sometimes=20; Often=40; Very often=60) and averages the responses. A score of 0 means every student chose the lowest response option; 60 means every student chose the highest response.

Engagement Indicator (0 to 60 scale)	NSSE	U of T (CIVIL)	U15 (CIVIL[1])	U of T All disciplines	U15 All disciplines	Ontario All disciplines
Academic Challenge						
1. Higher-Order Learning (HO)	2014	34.4	34.4	38.0	36.4	38.0
	2017	36.6	35.3	37.3	36.3	37.2
	2020	35.9	36.3	37.6	36.6	37.4
2. Reflective and Integrative Learning (RI)	2014	29.3	29.0	35.4	35.2	36.6
	2017	31.9	30.2	35.7	35.4	36.4
	2020	32.4	30.4	35.7	35.3	36.3
3. Learning Strategies (LS)	2014	33.7	31.5	35.7	35.1	35.2
	2017	31.8	31.9	34.5	34.5	34.1
	2020	31.5	32.7	34.6	34.6	34.1
4. Quantitative Reasoning (QS)	2014	33.6	35.2	25.5	26.7	27.0
	2017	35.3	33.5	27.0	27.2	27.6
	2020	31.9	33.9	27.4	27.4	27.8
Learning with Peers						
5. Collaborative Learning (CL)	2014	40.8	43.6	29.2	32.8	33.3
	2017	40.2	41.5	30.9	33.7	33.9
	2020	42.7	41.1	31.1	33.8	34.0
6. Discussions with Diverse Others (DD)	2014	43.1	40.2	42.3	40.3	41.7
	2017	42.9	42.0	41.0	39.3	40.4
	2020	45.7	41.1	39.7	39.0	40.2
Experiences with Faculty						
7. Student-Faculty Interaction (SF)	2014	12.3	16.0	17.5	17.2	18.9
	2017	16.1	16.3	18.0	17.4	18.9
	2020	19.4	17.8	17.3	16.9	18.2
8. Effective Teaching Practices (ET)	2014	28.1	32.4	35.3	34.9	35.8
	2017	31.3	32.7	34.3	34.4	34.5
	2020	34.5	34.1	34.9	34.6	34.5
Campus Environment						
9. Quality of Interactions (QI)	2014	34.0	39.2	37.2	39.0	39.6
	2017	34.6	39.1	36.2	38.4	38.3
	2020	40.9	40.8	36.3	38.8	39.2
10. Supportive Environment (SE)	2014	24.3	26.6	26.2	27.8	28.9
	2017	23.2	26.9	24.9	26.9	27.6
	2020	23.9	26.7	22.4	25.0	26.3
Responses						
	2014	67	436	4,684	20,993	21,721
	2017	70	663	4,658	24,971	24,105
	2020	61	446	4,475	23,145	22,639

[1]Program comparison group is based on the Classification of Instructional Programs (CIP) code 14.0801 (Civil Engineering, General) and 14.2101 (Mining & Mineral Engineering) .

https://www23.statcan.gc.ca/imdb/p3VD.pl?Function=getVD&TVD=299355

Notes:
1. Only responses from senior students are reported, as first year students have only had a small amount of time at the University and in their programs. Only responses from students enrolled in a specialist or major program are included.
2. U15 includes Alberta, British Columbia, Calgary, Dalhousie, Laval, Manitoba, McGill, McMaster, Montreal, Ottawa, Queen's, Saskatchewan, Waterloo, Western.

Academic Challenge - Higher-Order Learning survey items:
4b. Applying facts, theories, or methods to practical problems or new situations
4c. Analyzing an idea, experience, or line of reasoning in depth by examining its parts
4d. Evaluating a point of view, decision, or information source
4e. Forming a new idea or understanding from various pieces of information

Academic Challenge - Reflective & Integrative Learning survey items:
2a. Combined ideas from different courses when completing assignments
2b. Connected your learning to societal problems or issues
assignments
2d. Examined the strengths and weaknesses of your own views on a topic or issue
perspective
2f. Learned something that changed the way you understand an issue or concept
2g. Connected ideas from your courses to your prior experiences and knowledge

Academic Challenge - Learning Strategies survey items:
9a. Identified key information from reading assignments
9b. Reviewed your notes after class
9c. Summarized what you learned in class or from course materials

Academic Challenge - Quantitative Reasoning survey items:
6a. Reached conclusions based on your own analysis of numerical information
6b. Used numerical information to examine a real-world problem or issue
6c. Evaluated what others have concluded from numerical information

Learning with Peers - Collaborative Learning survey items:
1e. Asked another student to help you understand course material
1f. Explained course material to one or more students
1g. Prepared for exams by discussing or working through course material with other students
1h. Worked with other students on course projects or assignments

Learning with Peers - Discussions with Diverse Others survey items:
8a. People from a race or ethnicity other than your own
8b. People from an economic background other than your own
8c. People with religious beliefs other than your own
8d. People with political views other than your own

Experiences with Faculty - Student-Faculty Interaction survey items:
3a. Talked about career plans with a faculty member
3b. Worked w/faculty on activities other than coursework (committees, student groups, etc.)
3c. Discussed course topics, ideas, or concepts with a faculty member outside of class
3d. Discussed your academic performance with a faculty member

Experiences with Faculty - Effective Teaching Practices survey items:
5a. Clearly explained course goals and requirements
5b. Taught course sessions in an organized way
5c. Used examples or illustrations to explain difficult points
5d. Provided feedback on a draft or work in progress
5e. Provided prompt and detailed feedback on tests or completed assignments

Campus Environment - Quality of Interactions survey items:
13a. Students
13b. Academic advisors
13c. Faculty
13d. Student services staff (career services, student activities, housing, etc.)
13e. Other administrative staff and offices (registrar, financial aid, etc.)

Campus Environment - Supportive Environment survey items:
14b. Providing support to help students succeed academically
14c. Using learning support services (tutoring services, writing center, etc.)
14d. Encouraging contact among students from diff. backgrounds (soc., racial/eth., relig., etc.)
14e. Providing opportunities to be involved socially
14f. Providing support for your overall well-being (recreation, health care, counseling, etc.)
14g. Helping you manage your non-academic responsibilities (work, family, etc.)
14h. Attending campus activities and events (performing arts, athletic events, etc.)
14i. Attending events that address important social, economic, or political issues

High-Impact Practices

Certain undergraduate opportunities are designated "high-impact." High-Impact Practices (HIPs) share several traits: They demand considerable time and effort, facilitate learning outside of the classroom, require meaningful interactions with faculty and students, encourage collaboration with diverse others, and provide frequent and substantive feedback.

Percent of senior-year students who participated in one HIP, and two or more HIPs

NSSE	High-Impact Practices	U of T (CIVIL)	U15 (CIVIL[1])	U of T All discip-lines	U15 All discip-lines	Ontario All discip-lines
2014	One HIP	18.2%	17.0%	25.1%	26.7%	27.3%
	Two or more HIPs	80.0%	76.7%	49.7%	53.8%	52.7%
	Total who participated in at least one HIP	**98.2%**	**93.7%**	**74.8%**	**80.5%**	**79.9%**
2017	One HIP	18.3%	18.0%	27.3%	27.7%	28.4%
	Two or more HIPs	80.0%	77.5%	49.4%	54.8%	53.2%
	Total who participated in at least one HIP	**98.3%**	**95.4%**	**76.7%**	**82.5%**	**81.5%**
2020	One HIP	12.5%	13.3%	29.3%	26.4%	28.3%
	Two or more HIPs	83.3%	81.3%	47.2%	56.8%	53.9%
	Total who participated in at least one HIP	**95.8%**	**94.5%**	**76.5%**	**83.3%**	**82.2%**

The following activities are defined as High-Impact Practices:
11a. Internship, co-op, field experience, student teaching, or clinical placement
11c. Learning community or some other formal program where groups of students take two or more classes together
11d. Study abroad
11e. Work with a faculty member on a research project
11f. Culminating senior year experience (capstone course, senior project or thesis, comprehensive exam, portfolio, etc.)
12. Courses that included a community-based project (i.e., service-learning)

Frequency Distributions: General Questions
(Senior Student responses only)

How would you evaluate your entire educational experience at this institution?
Number of students (frequency) and Percent who responded 'Excellent' or 'Good'

	U of T (CIVIL)		U15 (CIVIL[1])		U of T (All disciplines)		U15 (All disciplines)		Ontario (All disciplines)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
2014	34	66.7%	287	80.6%	2,907	73.1%	14,228	80.2%	15,030	81.1%
2017	48	81.4%	446	79.2%	2,899	73.4%	17,176	80.0%	16,087	78.1%
2020	39	84.8%	306	81.8%	2,567	68.5%	15,031	77.4%	14,644	75.8%

If you could start over again, would you go to the SAME INSTITUTION you are now attending?
Number of students (frequency) and Percent who responded 'Definitely yes' or 'Probably yes'

	U of T (CIVIL)		U15 (CIVIL[1])		U of T (All disciplines)		U15 (All disciplines)		Ontario (All disciplines)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
2014	38	74.5%	295	83.1%	2,855	71.6%	14,217	80.1%	14,557	78.5%
2017	45	76.3%	445	78.9%	2,885	73.0%	17,153	79.8%	15,925	77.2%
2020	38	82.6%	315	83.8%	2,587	68.9%	15,429	79.3%	14,885	76.9%

[1]Program comparison group is based on the Classification of Instructional Programs (CIP) code 14.0801 (Civil Engineering, General) and 14.2101 (Mining & Mineral Engineering) .

https://www23.statcan.gc.ca/imdb/p3VD.pl?Function=getVD&TVD=299355

Data Source: National Survey of Student Engagement data, 2014, 2017. 2020 (field-level data analyzed from raw data (VP, Government, Community and Institutional Relations); UT, U15 and Ontario-level data from NSSE Reports).

Notes:
1. Only responses from senior students are reported, as first year students have only had a small amount of time at the University and in their programs. Only responses from students enrolled in a specialist or major program are included.
2. U15 includes Alberta, British Columbia, Calgary, Dalhousie, Laval, Manitoba, McGill, McMaster, Montreal, Ottawa, Queen’s, Saskatchewan, Waterloo, Western.

Appendix: B.5 Program of Industry Participants in CivMin Career Fair, January 2023

AECON
AECON.COM

As a Canadian leader in construction and infrastructure development with global expertise, Aecon Group Inc. (TSX: ARE) strives to be the number one Canadian infrastructure company. Aecon safely, profitably and sustainably delivers integrated solutions to private and public-sector clients through its Construction segment in the Civil, Urban Transportation, Nuclear, Utility and Industrial sectors, and provides project development, financing, investment and management services through its Concessions segment.

Aplin & Martin
APLINMARTIN.COM

Founded in 1968, Aplin Martin is multi-disciplinary firm of Civil Engineers, Urban Planners, Architects and Land Surveyors. Headquartered in Surrey, British Columbia, the company has expanded into several offices including Kelowna, Vancouver, Nanaimo, Calgary, Edmonton and Toronto, and employs over 250 people.

BGC Engineering
BGCENGINEERING.CA

BGC Engineering Inc. (BGC) is an international consulting firm that provides professional services in applied earth sciences. Our practice was established in 1990, based on a specialized appreciation of the impacts of geology on engineered structures. This continues to be our foundation today, enabling us to address a broad spectrum of engineering and environmental issues related to development in challenging terrain.

Counterpoint Engineering Inc.
COUNTERPOINTENG.COM

Counterpoint Engineering is an employee-owned, Canadian engineering consulting company based in the Greater Toronto Area. Land-development consulting and engineering is our specialty.
We offer civil engineering services to three major real estate sectors; commercial, residential, and urban redevelopment. We provide a full range of consulting and engineering services within the scope of land development, including project management, site feasibility, design, and contract administration.

Deloitte
DELOITTE.CA

"Deloitte" is the brand under which tens of thousands of dedicated professionals in independent firms throughout the world collaborate to provide audit, consulting, financial advisory, risk management, tax, and related services to select clients. These firms are members of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee ("DTTL"). Each DTTL member firm provides services in particular geographic areas and is subject to the laws and professional regulations of the particular country or countries in which it operates.

Dialog
DIALOGDESIGN.CA

We're a design practice comprising architects, urban planners, interior designers, structural, mechanical and electrical engineers, landscape architects, and sustainability consultants. We believe the diverse perspectives and expertise of our multi-disciplinary teams position us to tackle today's challenges in ways others can't.

Gannett Fleming
GANNETTFLEMING.COM

Founded in 1915, Gannett Fleming is a multidisciplinary engineering firm of professional engineers, technical designers, and project managers, working together to successfully deliver complex, sustainable infrastructure solutions. At Gannett Fleming, we are leaders in resilient and sustainable planning, design, and technology that withstand the forces of a rapidly changing world.

GeoSolv Design/Build
GEOSOLV.CA

Today, the wide range of Innovation Foundation Solutions™ offered by GeoSolv has become the gold standard in the ground improvement industry. Backed by Geopier®, GeoSolv continues to pioneer innovative approaches towards dealing with challenging soil conditions. We are committed to help our clients save money and improve project timelines by avoiding costly deep foundations or massive over-excavation and replacement. Over 12,000+ projects worldwide enjoy the solid foundation provided by Geopier® Systems.

Grounded Engineering
GROUNDEDENG.CA

Geotechnical, Environmental, and Geostructural Engineers located in Toronto. predominantly involved in land development in the Greater Golden Horseshoe.
We have about 100 staff members and our average age is 31 years old.

HDR
HDRINC.COM

We specialize in engineering, architecture, environmental and construction services.
We create an unshakable foundation for progress because our multidisciplinary teams also include scientists, economists, builders, analysts and artists.

Lea Consulting Ltd.
LEA.CA

LEA Consulting is an employee-owned engineering consulting firm, our practice areas are Structural Design, Civil Design, Transportation Planning & Design, Contract Administration, and Environmental Services with a history of over 65 years. We deliver projects in Transportation; (Master Plans, Transportation Planning studies, and Transportation Design), in Civil; (Transit, Stormwater, Water Resources, and Land Development), in Structures (Bridges, Transit Stations, and Highways), in Buildings (Institutional, Commercial and Residential), in Infrastructure Systems (Security, Electrical, and Intelligent Transportation Systems), and in Contract Administration; (Ministry of Transportation of Ontario related project).

Left Turn Right Turn (LTRT)

LTRT.CA

Left Turn Right Turn (LTRT) is a boutique consulting firm dedicated to delivering pragmatic solutions to help transit agencies and communities achieve visionary transformation. Our firm was founded as a public transportation consulting firm in 2014, drawing on the founder's 20+ years of transit experience and a passion for getting people out of cars and into transit. Since incorporation, the firm has seen steady growth and repeat business from numerous agencies and governments across the continent. In 2021, the firm expanded to create an accessibility division. We are passionate about improving communities through the collaborative exploration of solutions in transit and accessibility. We strive to help agencies improve their value proposition to customers and cultivate a culture of innovation by planning for new trends and technologies. Our transit practice combines experience in traditional transit planning, strategic planning, growth and business development with technology modernization, transformation, and innovation.

Matheson Constructors

MATHESONCONSTRUCTORS.COM

Matheson Constructors is a leading construction firm focused on delivering exceptional construction management, general contracting, design-build and public-private partnerships. With expertise spanning buildings, civil infrastructure, industrial and special projects, Matheson uses the latest digital technology to help our partners solve complex construction challenges to deliver on their most ambitious project goals. A trusted collaborator, Matheson reliably delivers quality service that ensures our projects and partners succeed.

Mattamy Homes

MATTAMYHOMES.COM

When it comes to forward-thinking homebuilding and thoughtfully planned communities, Canadians think of Mattamy Homes. And that success is centred on a foundation of great people, because our team is as solid as they come. At Mattamy, we are optimistic, hardworking and supportive. Together we learn and grow as we strive to create a positive impact in the homebuilding industry. Contributing to the Mattamy Way means being surrounded by caring people who encourage you to be exactly who you are. It means your opinion is invited and your contributions count. And it means a career filled with pride, knowing you're part of an environmentally-conscious, action-oriented organization with big plans for the future. The opportunity to bring the future of living to homeowners based on what Canadians value is exciting – and we're making it happen.

The Miller Group
MILLERGROUP.CA

The Miller Group, a division of Colas Canada Inc. headquartered in Markham, Ontario is a fully integrated and diversified transportation and infrastructure service provider diversified Canadian company with expertise in services like road and structure construction/rehabilitation, paving, and highway maintenance services. We also excel in manufacturing and transportation of construction materials including several aggregate-based products, cement, asphalt, and ready-mix concrete.

Morrison Hershfield
MORRISONHERSHFIELD.COM

Morrison Hershfield (MH) is a multi-discipline consulting engineering and management firm with 24 offices across North America and one office in Vizag, India. Our 11 Canadian offices span the country from coast-to-coast-to-coast. MH remains privately owned – 100% by its employees. Our projects portfolio includes large scale, multidisciplinary and complex infrastructure projects for both public and private sector clients, and delivers innovative, cost-effective solutions for both horizontal/linear and vertical infrastructure.

Morrison Hershfield delivers professional services to the North American market via four business units: Horizontal Infrastructure (Transportation Infrastructure, Transit, Water and Municipal Engineering, Bridge Engineering, Construction Administration); Environment Services (Natural Sciences, Ecology, Planning, Geo-Environmental); Integrated Engineering Design (Buildings and Facilities, Structural, Mechanical, Electrical Engineering, Telecommunications); and Building Specialty Services (Building Sciences and Building Envelop).

PreCon Precast Limited
OSCOCONSTRUCTIONGROUP.COM

The origins of the OSCO Construction Group go back to 1955 when Ocean Steel & Construction Ltd. was founded in Saint John, New Brunswick. Since that time, the OSCO Construction Group has grown to encompass four main operating sectors: Steel, Concrete, Construction and Corporate. Within these sectors lie an ever-expanding number of construction-related companies and divisions, serving a growing market area and employing over twelve hundred employees.
As a member of the OSCO Construction Group, we offer a comprehensive compensation package including health and dental coverage, life insurance, RRSP and tax-free savings account options. Additionally, we offer educational scholarships to children of employees, health & wellness programming, celebratory events and employee sport team sponsorships.

Read Jones Christoffersen
RJC.CA

Specializing in structural engineering, building science, structural restoration, structural glass engineering, parking facility design and building energy modelling, RJC Engineers (RJC) is one of Canada's leading engineering firms. Recognized as an exceptional workplace, we mentor next generation of Canada's 'best and brightest' engineers and technologists. With offices and expertise across Canada, we challenge our people to push technical boundaries and provide leadership in our fields of practice, while providing services for clients and projects nationwide.

We believe in taking care of our people and help them realize their full potential. RJC offers the opportunity to work in an engaging team environment where you will work on exciting and challenging projects, discover new and developing technologies, practices and techniques and where you will flourish in a culture of continuous learning and collaboration. Working under the guidance of leading technical specialists who broadly share their expertise, you will get to fine tune your skills and cultivate your expertise while being given the opportunity to pursue your professional goals."

Rocscience Inc.
ROCSCIENCE.COM

Rocscience is a world leader in developing 2D & 3D software for civil, mining, and geotechnical engineers. For over 20 years, we've built geotechnical tools used by more than 7,000 engineers around the world. We have 40 employees at our head office in Toronto, more than half of which hold advanced degrees in engineering.

R.V. Anderson Associates Limited
RVANDERSON.COM

R.V. Anderson Associates Limited was first established in 1948. We have around 400 employees. We specialize in Water, Wastewater, Transportation, and Urban Development. Our main office is located in Toronto and we have several offices all across Ontario and Eastern Canada. We Cater to both the public and private sector and we are continuously growing.

Synergy Partners
SYNERGYPARTNERS.CA

Synergy is a 100% employee-owned consulting firm focused on building engineering and capital planning. Founded in 2014 by six industry-leading engineers, Synergy has grown significantly to become a trusted engineering firm in the Canadian real estate industry.

We pride ourselves in being wholly owned by our employees and we believe in treating our clients and employees as valued partners. Our team is comprised of a talented, experienced, and diverse group of engineers, building science professionals, and support staff.

We provide engineering services to various real estate market sectors including Commercial, Multi-unit Residential, Condominiums, and Institutional."

WSP Canada
WSP.COM/EN-CA

WSP is one of the world's leading professional services firms. Our purpose is to future proof our cities and environments. We have over 55,000 team members across the globe. In Canada, our 9,800+ people are involved in everything from environmental remediation to urban planning, from engineering iconic buildings to designing sustainable transportation networks, from finding new ways to extract essential resources to developing renewable power sources for the future. The excellence we bring to our work and to our workplace has been recognized far and wide. We are among the LinkedIn Top 25 Companies two years in a row, one of the Top 100 Sustainable Companies in the World (and among the Top 10 in Canada), and we earned Platinum Elite Recognition through our participation in more than half of Canada's Top 100 Infrastructure Projects. At WSP

- We value our people and our reputation
- We are locally dedicated with international scale
- We are future focused and challenge the status quo
- We foster collaboration in everything we do
- We have an empowering culture and hold ourselves accountable.

York1
YORK1.COM

York1 is one of North America's oldest environmental and infrastructure companies, serving customers and communities with care and respect for over 70 years. As a recognized leader in the industry, we have worked on some of the largest and most complex commercial and residential projects across Ontario. We have the knowledge, experience, and resources necessary to get any job done safely and efficiently.

U of T - Master of Management of Innovation
UTM.UTORONTO.CA/MMI

The Master of Management of Innovation program attracts students with science, engineering and technology backgrounds. The graduate program prepares students with the knowledge, skills and strategic perspectives required to become leaders and senior managers.
Our curriculum provides a strong foundation in economic analysis, technology management, business strategy, finance, accounting, marketing and policy. The required academic core courses focus on management and economics; students select three electives tailored to their interests and goals.
Students must complete a 4-month internship in order to be eligible for graduation. The internship allows students to gain valuable, real-world work experience and an opportunity to demonstrate the key competencies the MMI program has taught them.

U of T - Department of Physical & Environmental Science
UTSC.UTORONTO.CA/PHYSSCI/

We offer three exceptional graduate programs for you to explore:
- a professional 12-month Master of Environmental Science program (also available part-time); and
- a PhD in Environmental Science Program (which provides 5 years of funding); and
- a brand new 16-month research-based MSc in Environmental Science program (first cohort begins May 2023).

Civil & Mineral Engineering
UNIVERSITY OF TORONTO

Graduate Studies in Civil Engineering

CIVMIN.UTORONTO.CA

U of T Civil & Mineral Engineering offers four graduate degrees for professional development and research-driven students.

MEng
The Master of Engineering Program is course-based and intended to provide continuing and advanced education for recent graduates and civil engineers in professional practice.

MEngCEM
To proactively respond to the changing needs of cities, the Masters of Engineering in Cities Engineering and Management program offers students a practicum to apply what they have learned in the classroom.

MASc
The Master of Applied Science includes a foundational base graduate courses followed with a research thesis. Many research projects involve industrial partnerships and networking opportunities, project management experience, and collaboration with leading experts. The MASc is a fully-funded program.

PhD
This program is designed for outstanding individuals interested in a rewarding career in fundamental or applied research. The Doctor of Philosophy program involves advanced courses and an intensive research program culminating in a thesis. The PhD is a fully-funded program.

@CivMin

CONNECT

An online platform to enrich your professional network and connect with the Skule™ community.

SIGN UP TODAY
uoftengineeringconnect.ca

UNIVERSITY OF TORONTO | Engineering

Appendix: B.6 Summary of Discussion from Student Services Staff Retreat, 2018

Civil Engineering
UNIVERSITY OF TORONTO

MEMORANDUM

TO: File

FROM: Sandy Walker

DATE: April 19, 2018

RE: Student Services Staff Retreat – Summary

The following is a consolidated recap of the Civil & Mineral Engineering Student Services and External Relations Office staff group discussion held on Friday, April 13, 2018.

Discussion #1: Defining the prime directive/generating a mission statement for the Student Services/External Relations

Who do we serve?
- Students (prospective, incoming, and in-progress undergraduate and graduate)
- Departmental faculty members
- Counterparts in cognate departments
- External groups (alumni, donors, industry reps, media, parents)

What do we contribute to the Department as a whole?
- We are the link between our students and faculty
- We serve as advocates for our students
- We strive to ensure student success
- We connect students to industry
- We manage external relationships on behalf of the Department (with prospective students, alumni, media and industry representatives)
- We are the heart of the Department

Mission statement (1st draft)

The Office of Student Services and External Relations is the first point of contact for the Civil and Mineral Engineering community, both internally and externally, dedicated to ensuring student success and serving as ambassadors in all aspects of the Department's operations to the best of our ability.

ONE DEPARTMENT, TWO GREAT PROGRAMS
Galbraith Building, 35 St. George Street, Toronto, ON, M5S 1A4 Canada
Tel: +1 416 978-3096 • Fax: +1 416 978-6813 • civil.engineering.utoronto.ca

Discussion 2: Functions of Student Services/External Relations office

Opening statement:

"Everything we do is related to alumni cultivation; this process starts during recruitment, carries throughout a student's undergraduate/graduate program, and continues as an alumnus relationship post graduation"

Services we provide:

Facilitate ***student recruitment***:

- develop outreach initiatives
- conduct external outreach (targeting both undergraduate and graduate / prospective and non-prospective applicants)
- program promotion/marketing (print/website)
- organize and deliver recruitment events
- recruit and train volunteers for recruitment events (faculty and students)
- assess all applications
- determine admission and scholarship offers
- target top applicants to ensure acceptance of offer
- manage relationships and expectations of parents
- respond to inquiries
- support and participate in all Faculty-led (FASE) recruitment initiatives

Facilitate ***admissions***:

- maintain ongoing communications with incoming students
- administer admissions process (both undergraduate and graduate) i.e., collection and verification of requisite student documentation
- communicate admission decisions
- manage applicant responses to admissions decisions
- record acceptance of offers
- assess and manage application system
- analysis of results (post admission cycle)

Manage ***program administration***

- ensure and maintain compliance with all institutional policies and procedures (FASE, SGS, University)
- maintain student records (print/files, on-line/ROSI)
- manage course scheduling
- coordinate and schedule midterms (undergrad) and program progression examinations (graduate, i.e., DEX, COMP, FOE, thesis presentations)
- maintain/update departmental academic calendar entries
- review and correct A&S HSS/CS course information (on departmental website)
- coordinate hiring and assignment of TAs

- coordination and record keeping for academic committees (i.e., Admissions, Curriculum, Scholarships and Awards, Graduate Studies, Academic Appeals)
- provide departmental representation to Faculty (FASE) committees (i.e., Admissions, Community Affairs and Gender Issues, Curriculum, Graduate Education, Scholarships and Awards, Teaching Methods and Resources, Examinations, et al), FASE Registrar's Office Student Services task force groups, and School of Graduate Studies advisory groups
- assist in preparation, coordination and administration of all field study/project based academic activities (i.e., Survey Camp, CIV201, MIN225, MIN400, CIV498 (capstone design) and CIV499 (thesis)
- organizing, running and providing follow up for (student) focus groups and town halls
- academic offenses (advising faculty of)
- tracking of student academic progress
- review student records for program completion and prepare recommendations for graduation
- assess and rank scholarship applications (institutional/internal awards, NSERC, OGS, etc.)
- calculate graduate student funding packages and communicate results to students and supervisors
- update and maintain master graduate student funding spreadsheet
- coordinate processes involved with academic misconduct matters and conflict resolution
- advise and update associate chairs (Undergraduate, Graduate) regarding program/student issues
- facilitate MEngCEM internship process + special aspects related to program
- scheduling/attending meetings

Provide ***student services***

- student advising in the following key areas:
    - all academic issues
    - policies and procedures
    - course selection (HSS/CS courses, technical electives)
    - curriculum mapping
    - health and wellness counselling/making referrals for appropriate services

- career counselling
    - communicating job/ internship opportunities
    - career advising
    - "Career Fair" preparation (i.e., personal presence, online presence, resume development
    - advising on PEY process/preparation (undergrad)

- general student services
    - advise on appropriate completion of forms (eg. program of study, project proposal, leave of absence, appeals/petitions

- advise and facilitate student scholarship applications; conduct outreach to top students to encourage scholarship application; assist students in preparing scholarship applications and advise on processes
- student advocacy
- facilitate student petitions
- administer course option selection
- troubleshoot course enrollment issues
- administer club funding request
- advise on processes associated to "Iron Ring"
- manage flow of mail for graduate students

Note:

Although 1st Year students are directed to the Faculty's First Year Office for academic guidance and counselling, the departmental Student Services office is also occasionally called upon to provide services and advising for 1st Year Civil and Mineral Engineering students.

The departmental SS/ER office also proactively provides outreach to 1st Year Civil and Mineral students to encourage and enlist their involvement in departmental events.

Support ***faculty***

- advise on institutional and departmental policies and practices
- provide mediation on students' issues
- advise on admissions /top applicant opportunities at graduate level
- coordinate and advise re: student research opportunities (undergrad and grad)
- manage expectations and relationships (i.e., student recruitment/supervision)
- coordinate and provide liaison for course and examination scheduling and troubleshoot faculty issues re: scheduling conflicts/room accommodation/equipment
- confirm course enrollment data for instructors
- advise on selection and facilitate hiring of TAs
- assist in course organization re: printing course materials, collecting assignments on behalf of instructors
- advise on how to use on-line systems (i.e., Blackboard/Sharepoint/Quercus, etc.)
- assist departmental committee chairs (and other members) in preparation of committee materials
- coordinate faculty involvement with guest lectures (securing participation for hosting guests/providing lecture introductions/welcoming remarks)
- assist in development of online and offline presence (media training, external relations management and support)
- creating, managing, provide training, and troubleshoot individual research group websites
- arranging room bookings and catering for meetings as requested

Steward ***alumni and external relationships***

- ensuring donor satisfaction by providing follow-up with scholarship benefactors

- serve as liaison with external stakeholders, FASE, UofT and public
- identify and follow-up on networking opportunities
- Alumni relations/CONNECT
- support FASE alumni portfolio
- serve as liaison with FASE Advancement and Alumni Office
- generate/create new events to further alumni engagement
- assessment of effectiveness of outreach (post event)
- engage alumni involvement with student education (i.e., capstone courses, guest lectures) and in student club initiatives
- cultivation of prospective advisory board members (Lassonde Advisory, CIV/MIN Industry Advisory Board)
- conduct outreach for participation in Career Fair and similar events

Support ***departmental administration***:

- ensure faculty graduate supervision eligibility
- assist in onboarding of new faculty
- facilitate invigilation
- troubleshoot "crisis management"
- troubleshoot "expectation management"
- oversee environmental scanning (i.e., monitoring of internal and external environments to detect opportunities and threats that may influence future departmental directions
- advocate for departmental participation/inclusion (in external activities/initiatives)
- develop opportunities for process development (i.e., setup and design of a process under specific requirements and within certain time-frames through defining and describing a sequence of activities that need to be performed in order to meet departmental objectives and produce desired outcomes)
- create and maintain departmental website content
- develop and coordinate graphic design(s) for all departmental stakeholders
- develop and coordinate production of marketing and other documents; follow-through on all aspects of departmental publications
- design, create and oversee installation of departmental signage
- support communications for all departmental events (i.e., develop signage/presentations)

Generate/coordinate/manage ***events***

- coordinate volunteer recruitment for all departmental events
- engage and identify student leaders to encourage participation in departmental events
- coordinate and manage all departmental events, including research group and student club events, encompassing the following logistics:
  - set agenda/define program
  - identify guest speakers
  - arrange catering, room booking, AV
  - coordinate volunteer recruitment and ensure event staffing
  - generate and coordinate event promotion
  - collate registrations and RSVP and prepare registration lists

  - prepare participant/guest nametags
  - draft speaking notes (i.e., welcoming remarks)
  - provide photographic services
  - manage all aspects of event at point of delivery

- manage event follow-up including:
  - expense/budget reconciliation
  - ensure follow through (i.e., thank you's to all involved – volunteers, keynotes, logistics support team)
  - provide critical assessment of value of event

Liaison with ***Chair's Office***:

Services performed by the Executive Assistant to the Chair:

- provide visitor/speaker support (i.e., build itinerary, arrange accommodation, arrange reservations for meetings/social activities, arrange transportation/ensure mobility, and provide escort during visit

Note:

The Office of Student Services and External Relations is also responsible for all aspects related to Departmental community events, such as the annual "End of Year" party, the "Scholarships and Awards" reception, and seasonal "Holiday" party. In addition, there are numerous one-off "special recognition" events such as promotion or retirement parties, and student club events, requesting support for assistance or coordination from the SS/ER office staff.

Discussion 3: **Examining the effectiveness of our current staffing structure, and the individual roles within it**

In summary, participants agreed that the collective productivity of the office as a whole is exceptional and output is prolific.

However, this is a small group endeavouring to cover a wide range of functions and although the status quo is being met, nothing else can get done as there is no capacity for any of the current staff members to take on new initiatives. As a result, Student Services facing is not being served as well as it should or could be. All participants expressed a strong desire for improvement, not only in the areas that they see as key to their individual roles, but in the Department's understanding of the range of services they are responsible for providing as well.

Participants also observed that transparency in communications, and inclusion in team decision-making is key to ensuring effective and efficient operations, and expressed a sentiment to see a greater extent of openness in this regard.

Participants identified that there are several functions currently assigned to the Office of Student Services and External Relations that do not directly align with the core mandate of the office, for example:

- organization and delivery of Departmental community social events
- facilitating organization of faculty or research group sponsored events
- onboarding of new faculty
- photocopying of course materials for instructors (i.e., this should be a TA function)
- arranging room bookings and catering for faculty member generated meetings
- troubleshooting individual research group websites

A cursory examination of the duties currently performed within each of the existing administrative staff positions suggests that there is opportunity for realignment of duties to aid in strengthening existing positions. For example, with the recent change in the composition of the graduate student funding packages, such that teaching assistantships are no longer a component, it is conceivable to move the responsibility for hiring of TAs to an alternate office, seeing as this activity will now be strictly a human resources function

Participants agreed that departmental operations as a whole could be more efficiently accomplished through the creation of one additional administrative support position, for example a general departmental assistant. Examples of duties that could be assigned to this role include:

- providing support for SS/ER initiated events (i.e., responsibility for room bookings, nametags, RSVP/registration lists, catering, etc.)
- responsibility for coordination of departmental community social events/parties
- assisting in course organization re: printing course materials, collecting assignments on behalf of instructors
- providing frontline information to faculty
- assisting in data information gathering and compiling results
- facilitating meeting scheduling and coordination in conjunction with Chair's office
- facilitating first stage MEng admissions assessment during recruitment cycles
- providing reception services on behalf of the SS/ER team

Further, the appointment of an academic leader to oversee and guide the administration of the MEngCEM program would aid the growth and development of this program. The MEngCEM (faculty) director would be responsible for oversight on program development and delivery, and internship cultivation.
The above-mentioned departmental assistant would provide support for administrative functions, such as record keeping, setting meetings and scheduling appointments on behalf of the director, and answering general inquiries.

In closing, participants agreed that they would continue discussions along these lines as part of their regular weekly staff meetings, with a view to identifying opportunities for refinement/reorganization of office functions. Each staff member will be invited to chair the discussion at each meeting on a rotating basis.

Appendix: B.7 Civil & Mineral Engineering Funding Packages 2022-23

How Funding Works:

Student Package = (Tuition/Fees + Minimum Guaranteed Funding + Top-Up) - Scholarship

RA = Research Assistantship. Paid by the Supervisor monthly via regular payroll

UF = University Fellowship. Paid by the Department and issued in as many installments as sessions that the student is registered in a given academic year

If a student's registration period changes, or if they receive an award during the academic year, the Department will re-calculate their funding package and re-issue the funding letter.

Only students in the funded cohort receive a funding letter

Packages are split based on legal status:

Program	Legal Status	UF	RA
PhD	Domestic	35%	65%
PhD	International	12%	88%
MASc	Domestic	35%	65%
MASc	International	30%	70%

Scroll Down to View 2022-2023 Packages

2022-12-13, 10:53 AM

CIVIL + MINERAL Funding Packages for 2022-2023

Student Account Payment Deadline: April 30, 2023

Domestic PhD

		Package Calculation = Tuition/Fees + Min. Guarantee + Top-Up				Payment Sources		
Major Award	**Total Package**	**Tuition + Incidental Fees**	**Minimum Guaranteed Funding 2022-23**	**Top-Up**	**Net Package (take home after tuition is paid)**	**Scholarship**	**Fellowship**	**RA**
NSERC VCGS	$55,554.28	$8,054.28	$18,500.00	$29,000.00	$47,500.00	$50,000.00	$1,944.00	$3,610.28
NSERC CGSD	$47,554.28	$8,054.28	$18,500.00	$21,000.00	$39,500.00	$35,000.00	$4,394.00	$8,160.28
TISC	$34,654.28	$8,054.28	$18,500.00	$8,100.00	$26,600.00	$17,900.00	$5,864.00	$10,890.28
NSERC PGSD	$33,554.28	$8,054.28	$18,500.00	$7,000.00	$25,500.00	$21,000.00	$4,394.00	$8,160.28
QEII-GSST	$31,554.28	$8,054.28	$18,500.00	$5,000.00	$23,500.00	$15,000.00	$5,794.00	$10,760.28
OGS*	$31,554.28	$8,054.28	$18,500.00	$5,000.00	$23,500.00	$10,000.00	$7,544.00	$14,010.28
None	$26,554.28	$8,054.28	$18,500.00	$-	$18,500.00	$-	$9,294.00	$17,260.28

International Ph.D.

Major Award	**Total Package**	**Tuition + Incidental Fees**	**Minimum Guaranteed Funding 2021-22**	**Top-Up**	**Net Package (take home after tuition is paid)**	**Scholarship**	**Fellowship**	**RA**
Trillium**	$41,310.28	$8,810.28	$18,500.00	$14,000.00	$32,500.00	$26,664.00	$5,126.20	$9,520.08
OGS*	$32,310.28	$8,810.28	$18,500.00	$5,000.00	$23,500.00	$10,000.00	$7,808.60	$14,501.68
Connaught***	$37,310.28	$8,810.28	$18,500.00	$10,000.00	$28,500.00	$10,000.00	$9,558.60	$17,751.68
Chinese Scholarship Council****	$8,810.28	$8,810.28	$-	$-	$-	$-	$1,057.23	$7,753.05
Conacyt	$37,310.28	$8,810.28	$18,500.00	$10,000.00	$28,500.00	$25,487.00	$4,138.15	$7,685.13
None	$27,310.28	$8,810.28	$18,500.00	$-	$18,500.00	$-	$3,277.23	$24,033.05

Domestic MASc

Major Award	**Total Package**	**Tuition + Incidental Fees**	**Minimum Guaranteed Funding 2021-22**	**Top-Up**	**Net Package (take home after tuition is paid)**	**Scholarship**	**Fellowship**	**RA**
NSERC CGSM	$31,204.28	$8,054.28	$17,000.00	$6,150.00	$23,150.00	$17,500.00	$4,796.50	$8,907.78
Gordon F. Newell	$30,054.28	$8,054.28	$17,000.00	$5,000.00	$22,000.00	$17,400.00	$4,429.00	$8,225.28
QEII-GSST	$30,054.28	$8,054.28	$17,000.00	$5,000.00	$22,000.00	$15,000.00	$5,269.00	$9,785.28
OGS*	$30,054.28	$8,054.28	$17,000.00	$5,000.00	$22,000.00	$10,000.00	$7,019.00	$13,035.28
None	$25,054.28	$8,054.28	$17,000.00	$-	$17,000.00	$-	$8,769.00	$16,285.28

International MASc

Major Award	**Total Package**	**Tuition + Incidental Fees**	**Minimum Guaranteed Funding 2021-22**	**Top-Up**	**Net Package (take home after tuition is paid)**	**Scholarship**	**Fellowship**	**RA**
OGS Visa	$52,120.28	$30,120.28	$17,000.00	$5,000.00	$22,000.00	$10,000.00	$12,636.08	$29,484.20
MITACS	$52,120.28	$30,120.28	$17,000.00	$5,000.00	$22,000.00	$15,000.00	$11,136.08	$25,984.20
None	$47,120.28	$30,120.28	$17,000.00	$-	$17,000.00	$-	$14,136.08	$32,984.20

*OGS scholarships are valued at $15,000. $10,000 is provided by the Ontario Government as a scholarship. The remaining $5,000 is paid by a fellowship top-up of $2,000 and an RA top-up of $3,000.

For any internal or external scholarships the student receives during the year *when no pre-approved package exists*:

Scholarship level	Student top-up	RAship reduction	Fellowship reduction
≤$3,000	X*	-	-
$3,000 - $5,000	$3,000	(X-$3,000)	-
$5,000 - $10,000	$3,000 + 0.5(X-$5,000)	$2,000 + 0.5(X-$5,000)	-
>$10,000	$5,500 + 0.333(X-$10,000)	$4,500 + 0.333(X-$10,000)	0.333(X-$10,000)
*Where X = total value of the scholarship ($)			

1. *Example*, if a student received a $6,000 internal scholarship:
   - Student's total funding package will increase by $3,500, RAship funding will be reduced by $2,500.
2. *Example*, if a student receives a $13,000 scholarship:
   - Student's total funding package will increase by $6,500, RAship funding will be reduced by $5,500 and Fellowship funding will be reduced by $1,000.

Appendix: B.8 School of Graduate Studies Academic Calendar - Civil Engineering 2022-23

Civil Engineering

1. Home
2. Programs
3. Civil Engineering

Program Overview

The Department of Civil and Mineral Engineering offers graduate programs leading to the **Master of Applied Science (MASc)**, the **Master of Engineering (MEng)**, and the **Doctor of Philosophy (PhD)**. Qualified students are accepted for advanced studies in one of the following fields: Building Engineering, Environmental Engineering, Geomechanics, Structural Engineering, and Transportation Engineering.

Students registered in a graduate degree program involving research are required to participate in the non-credit seminar course JDE 1000H *Ethics in Research* during their first or second session of registration.

The department also offers a graduate program in Cities Engineering and Management leading to the Master of Engineering in Cities Engineering and Management (MEngCEM).

Students may also be interested in combined degree programs:

- Environmental Biology (Specialist), Honours Bachelor of Science / Civil Engineering, Master of Engineering
- Environmental Biology (Specialist Co-op), Honours Bachelor of Science / Civil Engineering, Master of Engineering
- Environmental Chemistry (Specialist), Honours Bachelor of Science / Civil Engineering, Master of Engineering
- Environmental Chemistry (Specialist Co-op), Honours Bachelor of Science / Civil Engineering, Master of Engineering
- Environmental Geoscience (Specialist), Honours Bachelor of Science / Civil Engineering, Master of Engineering
- Environmental Geoscience (Specialist Co-op), Honours Bachelor of Science / Civil Engineering, Master of Engineering
- Environmental Physics (Specialist), Honours Bachelor of Science / Civil Engineering, Master of Engineering
- Environmental Physics (Specialist Co-op), Honours Bachelor of Science / Civil Engineering, Master of Engineering

Quick Facts

	Domestic	International
Application payment deadline	MASc, PhD: 1-Feb-2023 Fall 2023 entry MEng: 1-Jun-2023 Fall 2023 entry	MASc, PhD: 1-Feb-2023 Fall 2023 entry MEng: 1-Apr-2023 Fall 2023 entry
Minimum admission average	MASc, MEng: Mid-B in final year of bachelor's PhD: B+ average in Master's	MASc, MEng: Mid-B in final year of bachelor's PhD: B+ average in Master's
Direct entry option from bachelor's to PhD?	PhD: Yes (minimum A-minus average in bachelor's degree)	PhD: Yes (minimum A-minus average in bachelor's degree)
Is a supervisor identified before or after admission?	MASc, PhD: Before	MASc, PhD: Before
Is a supervisor assigned by the graduate unit or secured by the applicant?	MASc, PhD: Grad Unit	MASc, PhD: Grad Unit
Program length (full-time only)	MASc: 6 sessions MEng: 3 sessions PhD: 4 years; 5 years if entering directly from bachelor's	MASc: 6 sessions MEng: 3 sessions PhD: 4 years; 5 years if entering directly from bachelor's

Master of Applied Science

Program Description

The MASc program includes a foundational base of graduate courses followed by a research thesis. Many research projects involve industrial partnerships and networking opportunities, project management experience, and collaboration with leading experts.

Minimum Admission Requirements

- Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the Department of Civil Engineering's additional admission requirements stated below.
- A completed undergraduate degree equivalent to a four-year University of Toronto program with a minimum final-year grade point average (GPA) of a mid B (3.0 out of 4.0, or 75%). Required grades must be achieved in each of the final two years of undergraduate study. Competitive admission averages are typically near or above 80% (A–).
- Applicants whose primary language is not English and who graduated from a university where the language of instruction and examination was not English must demonstrate proficiency in English. See General Regulations section 4.3 for requirements.
- Students who do not possess an undergraduate degree in civil engineering may be required to take more than the usual time and number of courses.

Program Requirements

- Each student, in consultation with a staff member at the beginning of the program, will establish the distribution of time between coursework and thesis or design project.
- **Coursework.** Normally, students must complete a minimum of **2.5 full-course equivalents (FCEs)** (five half courses).
- **Research thesis.**
- Students must participate in the non-credit seminar course JDE1000H *Ethics in Research* during their first or second session of registration.
- In addition to the core research area, students have the option of completing an emphasis in Sustainable Energy as part of their degree program. Please see details in the Civil Engineering MASc, MEng, PhD Emphases section.

Program Length

6 sessions full-time (typical registration sequence: F/W/S/F/W/S)

Time Limit

3 years full-time

Master of Engineering

Program Description

The MEng program is course based and intended to provide continuing and advanced education for recent graduates and civil engineers in professional practice. The program can be taken on a full-time, extended full-time, or part-time basis.

Full-Time Option

Minimum Admission Requirements

- Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the Department of Civil Engineering's additional admission requirements stated below.
- A completed undergraduate degree equivalent to a four-year University of Toronto program with a minimum final-year grade point average (GPA) of a mid-B (3.0 out of 4.0 or 75%). Required grades must be achieved in each of the final two years of undergraduate study.
- Applicants whose primary language is not English and who graduated from a university where the language of instruction and examination was not English must demonstrate proficiency in English. See General Regulations section 4.3 for requirements.
- Students who do not possess an undergraduate degree in civil engineering may be required to take more than the usual time and number of courses.

Program Requirements

- Each student, in consultation with a staff member at the beginning of the program, will establish the distribution of time between coursework and thesis or design project.
- **Coursework.** Normally, students must complete **5.0 full-course equivalents (FCEs)** (10 half courses). Up to two half courses (1.0 FCE) may be replaced by a research/design project.
- Students have the option of completing an emphasis in Advanced Water Technologies; Analytics; Building Science; Concrete; Construction Management; Engineering and Globalization; Entrepreneurship, Leadership, Innovation and Technology in Engineering (ELITE); Environmental Engineering; Forensic Engineering; Geomechanics; Structural Engineering; Sustainable Energy; Sustainable Urban Systems; or Transportation Engineering and Planning as part of their degree program. Please see details in the Civil Engineering MASc, MEng, PhD Emphases section.

Program Length

3 sessions (typical registration sequence: F/W/S)

Time Limit

3 years

Extended Full-Time Option

Minimum Admission Requirements

- Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the Department of Civil Engineering's additional admission requirements stated below.
- A completed undergraduate degree equivalent to a four-year University of Toronto program with a minimum final-year grade point average (GPA) of a mid-B (3.0 out of 4.0 or 75%). Required grades must be achieved in each of the final two years of undergraduate study.
- Applicants whose primary language is not English and who graduated from a university where the language of instruction and examination was not English must demonstrate proficiency in English. See General Regulations section 4.3 for requirements.
- Students who do not possess an undergraduate degree in civil engineering may be required to take more than the usual time and number of courses.

Program Requirements

- Each student, in consultation with a staff member at the beginning of the program, will establish the distribution of time between coursework and thesis or design project.
- **Coursework.** Normally, students must complete **5.0 full-course equivalents (FCEs)** (10 half courses). Up to two half courses (1.0 FCE) may be replaced by a research/design project.
- Students are expected to complete the requirements in six sessions (two years) and are limited to six half courses per year and three half courses per session.
- Students have the option of completing an emphasis in Advanced Water Technologies; Analytics; Building Science; Concrete; Construction Management; Engineering and Globalization; Entrepreneurship, Leadership, Innovation and Technology in Engineering (ELITE); Environmental Engineering; Forensic Engineering; Geomechanics; Structural Engineering; Sustainable Energy; Sustainable Urban Systems; or Transportation Engineering and Planning as part of their degree program. Please see details in the Civil Engineering MASc, MEng, PhD Emphases section.

Program Length

6 sessions extended full-time (typical registration sequence: F/W/S/F/W/S)

Time Limit

3 years

Part-Time Option

Minimum Admission Requirements

- Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the Department of Civil Engineering's additional admission requirements stated below.
- A completed undergraduate degree equivalent to a four-year University of Toronto program with a minimum final-year grade point average (GPA) of a mid-B (3.0 out of 4.0 or 75%). Required grades must be achieved in each of the final two years of undergraduate study.
- Applicants whose primary language is not English and who graduated from a university where the language of instruction and examination was not English must demonstrate proficiency in English. See General Regulations section 4.3 for requirements.
- Students who do not possess an undergraduate degree in civil engineering may be required to take more than the usual time and number of courses.

Program Requirements

- Each student, in consultation with a staff member at the beginning of the program, will establish the distribution of time between coursework and thesis or design project.
- **Coursework.** Normally, students must complete **5.0 full-course equivalents (FCEs)** (10 half courses). Up to two half courses (1.0 FCE) may be replaced by a research/design project.
- Students are limited to four half courses per year and two half courses per session. Students normally complete the requirements in nine sessions.
- Students have the option of completing an emphasis in Advanced Water Technologies; Analytics; Building Science; Concrete; Construction Management; Engineering and Globalization; Entrepreneurship, Leadership, Innovation and Technology in Engineering (ELITE); Environmental Engineering; Forensic Engineering; Geomechanics; Structural Engineering; Sustainable Energy; Sustainable Urban Systems; or Transportation Engineering and Planning as part of their degree program. Please see details in the Civil Engineering MASc, MEng, PhD Emphases section.

Program Length

9 sessions

Time Limit

6 years

Doctor of Philosophy

Program Description

The PhD program is designed for outstanding individuals interested in a rewarding career in fundamental or applied research. This program involves advanced courses and an intensive research program culminating in a thesis.

Applicants may enter the PhD program via one of three routes: 1) following completion of an MASc degree in engineering, mathematics, physics, or chemistry; 2) transfer from the University of Toronto MASc program; 3) direct entry following completion of a bachelor's degree.

PhD Program

Minimum Admission Requirements

- Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the Department of Civil Engineering's additional admission requirements stated below.
- A completed undergraduate degree equivalent to a four-year University of Toronto program with a minimum final-year grade point average (GPA) of B+ (3.3 out of 4.0 or 78%). Required grades must be achieved in each of the final two years of undergraduate study. Competitive admission averages are typically near or above 80% (A–).
- Applicants whose primary language is not English and who graduated from a university where the language of instruction and examination was not English must demonstrate proficiency in English. See General Regulations section 4.3 for requirements.
- Applicants must satisfy the department of the ability to undertake advanced research.
- Admission directly from a bachelor's degree is permitted in exceptional cases.
- If a student transfers from a master's degree program to a PhD program, courses taken during the master's program may be applied to the PhD program.

Program Requirements

- **Students with an MASc degree** (or equivalent in the same area of study) must complete a minimum of **2.0 full-course equivalents (FCEs)** (four half courses).
- **Students with an MEng degree** must complete a minimum of **4.5 FCEs** (nine half courses). Up to 3.0 FCEs (six graduate half courses) may be used from the MEng program towards the PhD course requirements.
- Students enrolled in the MASc degree program who **transfer** to the PhD program must complete a total of **4.5 full-course equivalents (FCEs)** (nine half courses).
- For **direct-entry** students, more FCEs may be required depending on the student's background preparation. It is normally expected that at least one of the half courses will be taken outside of the student's principal area of research.
- **Comprehensive examination** after completing most of the coursework and preferably within one year after first enrolment in the PhD program. This examination consists of a four- to five-day take-home written examination, followed approximately a week later by an oral examination. The examination is administered by a Comprehensive Examination Committee created and supervised by the department's Graduate Studies Committee.
- **Residence.** Students normally must spend at least two academic years of their program on campus on a full-time basis.

- The academic program must be approved by the department's Graduate Studies Committee during the student's first session.
- Students must participate in the non-credit seminar course JDE1000H *Ethics in Research* during their first or second session of registration.
- Students have the option of completing an emphasis in Sustainable Energy as part of their degree program. Please see details in the Civil Engineering MASc, MEng, PhD Emphases section.

Program Length

4 years full-time; 5 years transfer-from-master's; 5 years direct-entry

Time Limit

6 years full-time; 7 years transfer-from-master's; 7 years direct-entry

PhD Program (Flexible-Time)

Minimum Admission Requirements

- Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the Department of Civil Engineering's additional admission requirements stated below.
- A completed undergraduate degree equivalent to a four-year University of Toronto program with a minimum final-year grade point average (GPA) of B+ (3.3 out of 4.0 or 78%). Required grades must be achieved in each of the final two years of undergraduate study. Competitive admission averages are typically near or above 80% (A–).
- Applicants whose primary language is not English and who graduated from a university where the language of instruction and examination was not English must demonstrate proficiency in English. See General Regulations section 4.3 for requirements.
- Applicants must satisfy the department of the ability to undertake advanced research.
- In addition, applicants must demonstrate that they are actively engaged in professional activities related to their proposed program of study.

Program Requirements

- **Students with an MASc degree** (or equivalent in the same area of study) must complete a minimum of **2.0 full-course equivalents (FCEs)** (four half courses).
- **Students with an MEng degree** must complete a minimum of **4.5 FCEs** (nine half courses). Up to 3.0 FCEs (six graduate half courses) may be used from the MEng program towards the PhD course requirements.
- Students enrolled in the MASc degree program who **transfer** to the PhD program must complete a total of **4.5 full-course equivalents (FCEs)** (nine half courses).
- For **direct-entry** students, more FCEs may be required depending on the student's background preparation. It is normally expected that at least one of the half courses will be taken outside of the student's principal area of research.
- **Comprehensive examination** after completing most of the coursework and preferably within one year after first enrolment in the PhD program. This examination consists of a four- to five-day take-home written examination, followed approximately a week later by

an oral examination. The examination is administered by a Comprehensive Examination Committee created and supervised by the department's Graduate Studies Committee.

- **Residence.** Students normally must spend at least two academic years of their program on campus on a full-time basis.
- Students must participate in the non-credit seminar course JDE1000H *Ethics in Research* during their first or second session of registration.
- Students have the option of completing an emphasis in Sustainable Energy as part of their degree program. Please see details in the Civil Engineering MASc, MEng, PhD Emphases section.

Program Length

6 years

Time Limit

8 years

Emphasis: Advanced Water Technologies (MEng only)

MEng students must successfully complete a total of **2.0 full-course equivalents (FCEs)** (four half courses). This includes at least one course (0.5 FCE) selected from the core course list. The remaining courses must be selected from the elective course list.

Core Courses (complete at least one):

CHE1150H *Industrial Water Technology*
CIV1308H *Physical and Chemical Treatment Processes*
CIV1309H *Biological Treatment Processes*
CIV1311H *Advanced and Sustainable Drinking Water Treatment*

Elective Courses (complete remaining courses):

CHE565H, CHE1213H, CHE1430H,
CIV541H, CIV549H, CIV550H, CIV1303H, CIV1319H, CIV1330H, CIV1399H, CIV1499H,
JCC1313H,
JNC2503H,
MIE1807H,
STA1004H.

Enrolment Contact

Enrolment in the emphasis is permitted at any time during the MEng program. After students are admitted to the normal MEng program, students may contact Prof. Ron Hofmann, (416) 946-7508.

Upon successful completion of the emphasis requirements and the successful completion of the MEng degree requirements, students will receive a transcript notation from the Faculty Graduate Studies office (subject to Prof. Hofmann's recommendation).

Emphasis: Analytics (MEng only)

To be admitted to the emphasis in Analytics, 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: CSC411H, CSC2515H, ECE421H, ECE1504H)
MIE1624H *Introduction to Data Science and Analytics* (exclusion: MIE1626H)
MIE1626H *Data Science Methods and Quantitative Analysis* (exclusion: MIE1624H)
MSE1065H *Application of Artificial Intelligence in Materials Design* (exclusion: MSE1063H).

Elective Courses

APS502H, APS1005H, APS1017H, APS1022H, APS1040H, APS1050H, APS1051H, APS1052H, APS1053H, APS1080H,
CEM1002H,
CHE507H, CHE1108H, CHE1148H, CHE1434H,
CIV1504H, CIV1506H, CIV1507H, CIV1532H, CIV1538H,
ECE537H, ECE1504H (exclusions: CSC411H, CSC2515H, ECE421H, ECE521H, ECE1513H),
ECE1505H, ECE1510H, ECE1657H, ECE1778H, ECE1779H,
MIE562H, MIE1077H, MIE1413H, MIE1501H, MIE1512H, MIE1513H, MIE1517H, MIE1620H, MIE1621H, MIE1622H, MIE1623H, MIE1625H, MIE1628H, MIE1653H, MIE1666H, MIE1721H, MIE1723H, MIE1727H, MIE1769H,
MSE1063H (exclusion: MSE1065H).

Emphasis: Building Science (MEng only)

MEng students must successfully complete at least **six half courses (3.0 full-course equivalents [FCEs])** with a combination of core and elective courses as detailed below. One or two of the optional courses may be a one-session (CIV1001H) or two-session (CIV1002Y) project (not listed below). Other courses may be considered but will require approval of the Building Science emphasis coordinator.

Core Courses (complete at least four):

CIV575H *Building Science*
CIV576H *Sustainable Buildings*
CIV578H *Design of Building Enclosures*
CIV1282H *Case Studies in Building Science*
CIV1320H *Indoor Air Quality*
MIE507H *HVAC Fundamentals*.

Elective Courses (others can be approved by the emphasis coordinator):

CIV514H, CIV536H, CIV577H, CIV1279H, CIV1299H,
MIE515H, MIE1240H.

Emphasis: Concrete (MEng only)

MEng students must successfully complete **six of the following technical courses (3.0 full-course equivalents [FCEs])**, one or two of which may be a one-session (CIV1001H) or two-session (CIV1002Y) project (not listed below). Other courses may be considered but will require approval of the Concrete emphasis coordinator.

CIV514H, CIV517H, CIV1201H, CIV1250H, CIV1252H, CIV1260H, CIV1262H, CIV1275H, CIV1504H.

Emphasis: Construction Management (MEng only)

MEng students must successfully complete **six of the following technical courses (3.0 full-course equivalents [FCEs])**, one or two of which may be a one-session (CIV1001H) or two-session (CIV1002Y) project (not listed below). Other courses may be considered but will require approval of the Construction Management emphasis coordinator.

APS1001H, APS1004H, APS1005H, APS1017H,
CIV1279H, CIV1281H, CIV1299H, CIV1307H, CIV1504H,
MIE562H, MIE1413H.

Emphasis: Engineering and Globalization (MEng only)

MEng students must successfully **complete four half courses (2.0 full-course equivalents [FCEs])** from the following lists, with at least two half courses (or one full course) chosen from Group A.

Group A

APS510H, APS530H, APS1420H, JCR1000Y (full-year course).

Group B

APS1015H, APS1020H, APS1024H, CHL5700H, CIV1399H, JMG2020H.

Note: Students who choose to pursue an MEng project in their home department that aligns with the Centre for Global Engineering (CGEN)'s disciplinary focus, as deemed by the CGEN Director, may count the project as one required Group B course.

Students who complete the requirements of the emphasis in Engineering and Globalization and wish to obtain a notation on their transcript should contact the Faculty Graduate Studies office.

Emphasis: Entrepreneurship, Leadership, Innovation and Technology in Engineering (ELITE) (MEng only)

MEng students must successfully complete **any four of the following courses (2.0 full-course equivalents [FCEs])**:

Leadership

TEP1010H, TEP1011H, TEP1026H, TEP1027H, TEP1029H, TEP1030H, TEP1501H, TEP1502H, TEP1601H

Entrepreneurship and Innovation

APS1012H, APS1013H, APS1015H, APS1023H, APS1033H, APS1035H, APS1036H, APS1041H, APS1061H, APS1088H

Finance and Management

AER1601H, APS502H, APS1001H, APS1004H, APS1005H, APS1009H, APS1016H, APS1017H, APS1020H, APS1022H, APS1028H, APS1032H, APS1038H, APS1039H, APS1040H, APS1043H, APS1049H, APS1050H, APS1051H, APS1052H

Engineering and Society

APS510H, APS1018H, APS1024H, APS1025H, APS1031H, APS1034H, APS1101H, APS1420H.

Emphasis: Environmental Engineering (MEng only)

MEng students must successfully complete **six of the following technical courses (3.0 full-course equivalents [FCEs])**, one or two of which may be a one-session (CIV1001H) or two-session (CIV1002Y) project (not listed below). Other courses may be considered but will require approval of the Environmental Engineering emphasis coordinator.

CHE1134H, CHE1150H, CHE1180H, CHE1431H, CHE1432H,
CHL5903H,
CIV541H, CIV549H, CIV550H, CIV577H, CIV1303H, CIV1307H, CIV1308H, CIV1311H, CIV1319H, CIV1320H, CIV1399H,
ENV1001H, ENV1701H,
JCC1313H,
JNC2503H,
MIE1240H.

Emphasis: Forensic Engineering (MEng only)

MEng students must successfully complete **four courses (one core course and three elective courses)** from the list below.

Core Course

MSE1031H *Forensic Engineering*.

Elective Courses

AER1604H,
APS1034H, APS1039H, APS1040H, APS1101H,
BME1480H, BME1800H, BME1801H, BME1802H,
CHE561H, CHE568H, CHE1213H, CHE1431H, CHE1432H, CHE1434H, CHE1436H,
CIV510H, CIV518H, CIV1163H, CIV1171H, CIV1174H, CIV1190H, CIV1201H, CIV1279H,
CIV1282H, CIV1422H, CIV1429H,
JMB1050H,
JNC2503H,
MIE507H, MIE533H, MIE566H, MIE1301H, MIE1303H, MIE1411H, MIE1414H, MIE1514H,
MIE1616H, MIE1708H, MIE1713H, MIE1714H, MIE1721H, MIE1723H, MIE1727H,
MIE1804H,
MSE1015H, MSE1016H, MSE1022H, MSE1032H, MSE1067H.

Emphasis: Geomechanics (MEng only)

MEng students must successfully complete **six of the following technical courses (3.0 full-course equivalents [FCEs])**, one or two of which may be a one-session (CIV1001H) or two-session (CIV1002Y) project (not listed below). Other courses may be considered but will require approval of the Geomechanics emphasis coordinator.

CIV523H, CIV1404H, CIV1419H, CIV1420H, CIV1429H, CIV1498H, CIV1499H,
MIN540H, MIN565H.

Emphasis: Structural Engineering (MEng only)

MEng students must successfully complete **six of the following technical courses (3.0 full-course equivalents [FCEs])**, one or two of which may be a one-session (CIV1001H) or two-session (CIV1002Y) project (not listed below). Other courses may be considered but will require approval of the Structural Engineering emphasis coordinator.

CIV510H, CIV514H, CIV515H, CIV517H, CIV518H, CIV519H, CIV1163H, CIV1164H,
CIV1167H, CIV1169H, CIV1171H, CIV1174H, CIV1175H, CIV1180H, CIV1361H.

Emphasis: Sustainable Energy (MASc, MEng, PhD)

MASc and PhD students must successfully complete:

- At least **three half courses (1.5 full-course equivalents [FCEs])** from either of the following lists below.
- A **thesis** towards their degree on a topic related to sustainable energy. Topics must be approved by the steering committee of the Institute of Sustainable Energy. Contact: Mandeep Rayat

MEng students must successfully complete:

- **Four half courses (2.0 FCEs)** from either of the following lists below, including at least one core course (0.5 FCE).

Core Courses

APS1032H *Introduction to Energy Project Management*,
MIE515H *Alternative Energy Systems*,
MIE1120H *Current Energy Infrastructure and Resources*.

Elective Courses

AER507H, AER1304H, AER1315H, AER1415H,
CHE568H, CHE1053H, CHE1118H, CHE1123H, CHE1142H, CHE1143H,
CIV575H, CIV576H, CIV577H, CIV1303H, CIV1307H,
ECE533H, ECE1030H, ECE1055H, ECE1057H, ECE1059H, ECE1085H, ECE1086H,
ECE1092H, ECE1094H, ECE1476H,
MIE516H, MIE517H, MIE1128H, MIE1129H, MIE1130H, MIE1240H, MIE1715H,
MSE1023H, MSE1028H, MSE1058H.

Students who complete the requirements of the emphasis in Sustainable Energy will receive a notation on their transcript from the Faculty Graduate Studies Office following a recommendation from the Institute of Sustainable Energy. Contact: Mandeep Rayat.

Emphasis: Sustainable Urban Systems (MEng only)

MEng students must successfully complete **six of the following technical courses (3.0 full-course equivalents [FCEs])**, one or two of which may be a one-session (CIV1001H) or two-session (CIV1002Y) project (not listed below). Other courses may be considered but will require approval of the Sustainable Urban Systems emphasis coordinator.

APS510H, APS1024H, APS1025H,
CIV514H, CIV516H, CIV531H, CIV575H, CIV576H, CIV577H, CIV1201H, CIV1252H,
CIV1280H, CIV1303H, CIV1307H, CIV1535H,
ECE1092H,
ENV1001H,
MIE515H, MIE1120H, MIE1240H, MIE1715H.

Emphasis: Transportation Engineering and Planning (MEng only)

MEng students must successfully complete **six of the following technical courses (3.0 full-course equivalents [FCEs])**, one or two of which may be a one-session (CIV1001H) or two-session (CIV1002Y) project (not listed below). Other courses may be considered but will require approval of the Transportation Engineering and Planning emphasis coordinator.

CIV516H, CIV531H, CIV536H, CIV1307H, CIV1506H, CIV1508H, CIV1532H, CIV1535H, CIV1536H, CIV1538H.

Emphasis: Waterpower (MEng only)

MEng students must successfully complete **four half courses (2.0 full-course equivalents [FCEs]**, including one core course. The remaining coursework may be taken from the following lists.

Core Course

APS1410H *Waterpower Essentials*.

Group A (complete at least one)

APS1411H (prerequisite: APS1410H),
CIV550H.

Group B (complete at least one)

AER1410H,
APS1024H, APS1032H,
CIV514H, CIV523H, CIV580H, CIV1001H, CIV1163H, CIV1171H, CIV1252H, CIV1275H, CIV1279H, CIV1281H, CIV1303H, CIV1399H, CIV1420H,
CIV1XXXH *Design of Hydro and Wind Electric Plants* (pending approval; exclusion: CIV401H),
ECE514H, ECE533H, ECE1049H, ECE1059H, ECE1093H, ECE1094H,
ENV1001H, ENV1701H, ENV1703H,
MIE1201H, MIE1207H, MIE1210H, MIE1222H, MIE1241H.

Graduate Unit Details

Civil and Mineral Engineering

- Academic Calendar / Civil Engineering
- Department Website

Faculty Affiliation

Applied Science and Engineering

Degrees Offered

Civil Engineering

MASc

- Emphasis:
  - Sustainable Energy

MEng

- Emphases:
  - Advanced Water Technologies;
  - Analytics;
  - Building Science;
  - Concrete;
  - Construction Management;
  - Engineering and Globalization;
  - Entrepreneurship, Leadership, Innovation and Technology in Engineering (ELITE);
  - Environmental Engineering;
  - Forensic Engineering;
  - Geomechanics;
  - Structural Engineering;
  - Sustainable Energy;
  - Sustainable Urban Systems;
  - Transportation Engineering and Planning;
  - Waterpower

PhD

- Emphasis:
  - Sustainable Energy

Cities Engineering and Management

MEngCEM

Contact & Address

Admission Inquiries

Web: civmin.utoronto.ca
Email: admissions.civmin@utoronto.ca
Telephone: (416) 978-3099
Fax: (416) 978-6813

Note: please direct all admission inquiries to admissions.civmin@utoronto.ca (not civ.gradprograms@utoronto.ca).

Student Services Inquiries

General inquiries: info.civmin@utoronto.ca

PhD and MASc programs: Colleen Kelly
Email: civ.gradprograms@utoronto.ca
Telephone: (416) 978-5904

MEng and MEngCEM programs: Alison Morley
Email: meng.civmin@utoronto.ca
Telephone: (416) 946-8028

Department of Civil and Mineral Engineering
University of Toronto
Galbraith Building 35 St. George Street, Room 116
Toronto, Ontario M5S 1A4
Canada

	Domestic	International
Application payment deadline	MASc, PhD: 1-Feb-2023 Fall 2023 entry MEng: 1-Jun-2023 Fall 2023 entry	MASc, PhD: 1-Feb-2023 Fall 2023 entry MEng: 1-Apr-2023 Fall 2023 entry
Minimum admission average	MASc, MEng: Mid-B in final year of bachelor's PhD: B+ average in Master's	MASc, MEng: Mid-B in final year of bachelor's PhD: B+ average in Master's
Direct entry option from bachelor's to PhD?	PhD: Yes (minimum A-minus average in bachelor's degree)	PhD: Yes (minimum A-minus average in bachelor's degree)
Is a supervisor identified before or after admission?	MASc, PhD: Before	MASc, PhD: Before
Is a supervisor assigned by the graduate unit or secured by the applicant?	MASc, PhD: Grad Unit	MASc, PhD: Grad Unit
Program length (full-time only)	MASc: 6 sessions MEng: 3 sessions PhD: 4 years; 5 years if entering directly from bachelor's	MASc: 6 sessions MEng: 3 sessions PhD: 4 years; 5 years if entering directly from bachelor's

Appendix: B.9 Degree Level Expectations for Graduates Receiving the Degree of Master of Engineering

Degree Level Expectations for Graduates Receiving the Degree of Master of Engineering

Faculty of Applied Science and Engineering

University of Toronto

This degree is awarded to students who have demonstrated the following:

1. Depth and Breadth of Knowledge

A systematic understanding of engineering and applied science knowledge including, where appropriate, relevant knowledge outside the field and engineering discipline, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of their engineering or applied science discipline.

2. Knowledge of Methodologies

A conceptual understanding and methodological competence that

(a) Enables a working comprehension of how established techniques of inquiry are used to interpret knowledge in the discipline;

(b) Enables a critical evaluation of current developments in the discipline;

(c) Enables a treatment of technical issues and judgments based on established principles and techniques.

3. Level of Application of Knowledge

Competence in the application of an existing body of data in the critical analysis of advanced problems or issues. Here, advanced indicates a difficulty level beyond that encountered at the undergraduate level.

4. Professional Capacity/Autonomy

(a) The qualities and transferable skills necessary for employment requiring:
- (i) The exercise of initiative and of personal responsibility and accountability; and
- (ii) Decision-making in complex situations;

(b) The intellectual independence required for continuing professional development;

(c) The ethical behaviour consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct in a professional context; and

(d) The ability to participate meaningfully as leaders in society.

5. Level of Communications Skills

The ability to communicate ideas, issues, and conclusions clearly in oral and written form. This includes being capable of constructing a credible argument and presenting it in appropriate formats.

6. Awareness of the Limits of Knowledge

Cognizance of the complexity of knowledge, its underlying assumptions, and the potential contributions of other interpretations, methods, and disciplines.

Approved on March 8, 2011 by Faculty Council

Appendix: B.10 Degree Level Expectations for Graduates Receiving the Degree of Master of Applied Science

Degree Level Expectations for Graduates Receiving the Degree of Master of Applied Science

Faculty of Applied Science and Engineering

University of Toronto

This degree is awarded to students who have demonstrated the following:

1. Depth and Breadth of Knowledge

A systematic understanding of engineering and applied science knowledge including, where appropriate, relevant knowledge outside the field and engineering discipline, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of their engineering or applied science discipline.

2. Research and Scholarship

A conceptual understanding and methodological competence that

(a) Enables a working comprehension of how established techniques of research and inquiry are used to create and interpret knowledge in the discipline;

(b) Enables a critical evaluation of current research and advanced research and scholarship in the discipline;

(c) Enables a treatment of complex issues and judgments based on established principles and techniques; and

On the basis of that competence, has shown both of the following:

(d) The development and support of a sustained argument in written form; and

(e) Originality in the application of engineering or applied science knowledge.

3. Level of Application of Knowledge

(a) Competence in the research process by applying an existing body of knowledge in the critical analysis of a new question or of a specific problem or issue in a new setting; and

(b) The ability to exercise leadership in research innovation.

4. Professional Capacity/Autonomy

(a) The qualities and transferable skills necessary for employment requiring:
- (i) The exercise of initiative and of personal responsibility and accountability; and
- (ii) Decision-making in complex situations;

(b) The intellectual independence required for continuing professional development including the ability for self-directed life-long learning;

(c) The ethical behaviour consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research; and

(d) The ability to appreciate the broader implications of applying knowledge to particular context.

5. Level of Communications Skills

The ability to communicate ideas, issues, and conclusions clearly in oral and written form.

6. Awareness of the Limits of Knowledge

Cognizance of the complexity of knowledge, its underlying assumptions, and the potential contributions of other interpretations, methods, and disciplines.

Approved on March 8, 2011 by Faculty Council

Appendix: B.11 Degree Level Expectations for Graduates Receiving the Doctor of Philosophy

Degree Level Expectations for Graduates Receiving the Degree of Doctor of Philosophy

Faculty of Applied Science and Engineering

University of Toronto

This degree extends the skills associated with the Master of Applied Science degree and is awarded to students who have demonstrated the following:

1. Depth and Breadth of Knowledge

A thorough understanding of a substantial body of engineering or applied science knowledge that is at the forefront of their engineering or applied science discipline including, where appropriate, relevant knowledge outside the field.

2. Research and Scholarship

(a) The ability to conceptualize, design, and implement research for the generation of new knowledge, applications, or understanding at the forefront of the discipline, and to adjust the research design or methodology in light of unforeseen problems;

(b) The ability to make informed judgments on complex issues in specialist fields, sometimes requiring new methods; and

(c) The ability to produce original research, or other advanced scholarship, of quality to satisfy peer review, and to merit publication.

3. Level of Application of Knowledge

The capacity to

(a) Undertake pure and/or applied research at an advanced level;

(b) Contribute to the development of academic or professional skills, techniques, tools, practices, ideas, theories, approaches, and/or materials; and

(c) Exercise leadership in research innovation.

4. Professional Capacity/Autonomy

(a) The qualities and transferable skills necessary for employment requiring the exercise of personal responsibility and largely autonomous initiative in complex situations;

(b) The intellectual independence to be academically and professionally engaged and current;

(c) The ethical behaviour consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research; and

(d) The ability to evaluate the broader implications of applying knowledge to particular contexts.

5. Level of Communications Skills

The ability to communicate complex and/or ambiguous ideas, issues, and conclusions clearly and effectively in oral and written form.

6. Awareness of the Limits of Knowledge

An appreciation of the limitations of one's own work and discipline, of the complexity of knowledge, and of the potential contributions of other interpretations, methods, and disciplines.

Approved on March 8, 2011 by Faculty Council

Faculty

Appendix: C.1 Courses Taught by Sessional Instructors, 2022-2023

Civil and Mineral Engineering Courses Taught by Sessional Instructors, 2022-23

Course	Level	Session	Name	Instructor	Professional Affiliation
CEM1001	Grad	F	The Challenges of Urban Policy-Making	Hasham, Adam	MEngCEM alumnus; Transportation & Public Policy Consultant (City of Toronto)
CEM1002	Grad	F	Empirical Study of Cities	Hasham, Adam	MEngCEM alumnus; Transportation & Public Policy Consultant (City of Toronto)
CEM1003	Grad	S*	Infrastructure and Urban Prosperity	Hammadi, Ayad	MEngCEM and PhD alumnus; Structural Engineering Consultant
CIV1190	Grad	F	Structures under Blast and Impact	Seica, Michael	PhD alumnus; Director Explora Security
CIV1201	Grad	F	Concrete Technology and Non-Destructive Testing Principles	Aqel, Mohammad	PhD alumnus; Concrete Engineering, Ministry of Transportation, Ontario
CIV1252	Grad	F	Infrastructure Renewal	Schell, Hannah	Director, Concrete Technology, Ministry of Transportation (retired)
CIV1279	Grad	F	Construction Contract Documents	Thapar, Jiwan	MEng alumnus; Chief Executive Officer, JTE Claims Consultants
CIV1283	Grad	Summer	Advanced Asset Management: Quantitative Tools and Methods	Hesham Osman	PhD alumnus; Professor, Cairo University
CIV1285	Grad	Summer	Building Information Modeling	Jinyue Zhang	MASc and PhD alumnus; Associate Professor, Tianjin University
CIV1298	Grad	S	Introduction to Construction Claims	Thapar, Jiwan	MEng alumnus; Chief Executive Officer, JTE Claims Consultants
CIV1330	Grad	S	WASH	Cantwell, Ray	PhD alumnus; Water Process Engineer, Jacobs
CIV1399	Grad	F	Plotting the Path to Net Zero Greenhouse Gas Emissions	Sinclair, Ian	Independent consultant - Energy, Water and Sustainablility in Engineering
CIV1499	Grad	S	Applications of Urban Geology in Civil Engineering	Staseff, David	BASc and MASc alumnus; Senior Foundations Engineering, Ontario Ministry of Transportation
CIV1508	Grad	F	Airport Planning and Engineering	Doshi, Naren	MEng alumnus; Director, Planning Department, Greater Toronto Airport Authority
APS160	UG	F	Mechanics - Online course	Seica, Michael	PhD alumnus; Director, Explora Security
CIV100	UG	F	Mechanics - Coordinator	Seica, Michael	PhD alumnus; Director, Explora Security
CIV100	UG	F	Mechanics	Seica, Michael	PhD alumnus; Director, Explora Security
CIV250	UG	S	Hydraulics and Hydrology	Akbari.Saidal	BASc, MASc and PhD alumnus; Civil Engineering Lead, Stantec Limited
CIV300	UG	F & S	Terrestrial Energy Systems	Sinclair, Ian	Independent consultant - Energy, Water and Sustainablility in Engineering

Civil and Mineral Engineering Courses Taught by Sessional Instructors, 2022-23

Course	Level	Session	Name	Instructor	Professional Affiliation
CIV420	UG	F	Construction Engineering	Mohammadi, Alireza	Manager Asset Management, Metrolinx
CIV498	UG	S	Group Design Project -Structures (1)	Andrews, Chris	Senior Vice President, Ellis Don
CIV498	UG	S	Group Design Project -Structures (2)	Abrishami, Homayoun	Senior Structural Engineer, Structures and Computers LTD
CIV498	UG	S	Group Design Project - Building Science	Morlidge, Melissa	Building Scientist, RDH Building
CIV498	UG	S	Group Design Project - Building Science	Zhang, Kevin	BASc and MEng alumnus; Building Envelope Specialist, Entuitive
CIV498	UG	S	Group Design Project - Transport (1)	Saiyed, Sabbir	Director, Infrastructure Planning and Design, Region of Peel
CIV498	UG	S	Group Design Project - Global Sustainability	Cadario, Paul	BASc alumnus; past CFO, World Bank
CIV498	UG	S	Group Design Project - Global Sustainability	Dunets, Anna	BASc alumnae; Senior Project Engineer, PlanningAlliance
CIV498	UG	S	Group Design Project - Water	Hellebust, Andrew	President, Rivercourt Engineering
CIV518	UG	S	Behaviour and Design of Steel Structures	Simpson, Michael	MASc and PhD alumnus; Chief Engineer, Consultec Inc
CIV523	UG	S	Geotechnical Design	Skinner, Graeme	Senior Geotechnical Engineer, GEMTEC Consulting
CIV523	UG	S	Geotechnical Design	Olumuyiwa, Timi	Geotechnical Engineer, GEMTEC Consulting
CIV578	UG	S	Design of Building Enclosures	De Rose, David	CEO Synergy Partners
CIV578	UG	S	Design of Building Enclosures	O'Malley, Lori	Building Envelope Specialist, PCL Construction
MIN120	UG	S	Insight into Mineral Engineering (new course for 2020/2021	Williams, Emilie	Independent Mining Engineer
MIN301	UG	F	Mineral Reserve and Mineral Resource Estimation	Lambden, Alan	President and CEO, RedDot3D Inc
MIN330	UG	S	Mining Environmental Management	Julien, Michel	VP Environment, Agnico Eagle Mines
MIN330	UG	S	Mining Environmental Management	VanEngen, Ryan	Permitting Lead, Agnico Eagle Mines
MIN400	UG	F	Geology Field Camp for Engineers	Moss, Roger	CEO at Labrador Gold Corp
MIN450	UG	F	Mineral Economics	Starogiannis, Michael	BASc alumnus; Director, Saitfish Royalties Corp
MIN467	UG	S	Mineral Project Design II	Gardner, James	BASC alumnus; Senior Mining Consultant at Mining Plus
MIN470	UG	S	Ventilation and Occupational Health	Rawlins, Alec	Director, RME Consulting

Appendix: C.2 Workload Policy and Procedures for Faculty in Civil & Mineral Engineering

Workload Policy and Procedures for Faculty in Civil Engineering (updated December 2015)

The following policy applies to tenure and teaching stream faculty in the Department of Civil Engineering as required by the University of Toronto Workload Policy and Procedures for Faculty and Librarians (WLPP)[1]. It was developed based on the framework developed by the Faculty (see Appendix B) and reflects what has been the recent practice in our Department.

Workload is comprised of three components, Research, Teaching (which can include graduate student research supervision) and Service. This document is only concerned with aspects of workload in Teaching and Service that are assignable by the Department Chair during the academic year (July 1 – June 30). Research, as well as graduate student research supervision, are primarily self-directed aspects of tenure-stream faculty and are not covered by this document.

It is recognized that service can cover a wide range of activities, some of which are self-directed by the faculty member. In the context of this document, service is primarily to the Department, Faculty or University, in the form of administrative duties and/or committee work. In a few instances it may also include service to the profession in the form of major participation or leadership roles on association boards and government committees, granting agency review committees and editorial boards of major journals.

Though not covered by this policy, we recognize that research and self-directed service are essential elements for the Department that represent a significant fraction of a faculty member's total workload. All tenure stream faculty are expected to continue to make significant contributions to research. A reduced teaching and service workload is provided to pre-tenure faculty to provide time to develop their research programs.

The overall responsibility for overseeing workload rests with the Chair of the Department who is expected to allocate workload in order to serve the best interests of the Department in a collegial and fair manner. Specific aspects are the main responsibility of the appropriate Associate Chair. The Chair will review assignments under this policy at least once per year. Where appropriate, adjustments can be made over the course of several years in order to balance workload. Teaching assignments by course, course enrolment, and the main committee/service assignments covered by this policy will be made available to all faculty. Timing of assignment of various elements of faculty workload is outlined in Appendix A.

Teaching for Tenured and Tenure Stream Faculty:

1. The normal course load for tenure stream faculty is 3 courses**.** This will usually consist of one graduate course and two undergraduate courses. Course load is proportional to the appointment expressed as Full Time Equivalents (FTE), with 1.0 FTE being the usual FTE. This will be adjusted for administrative appointments, budgetary cross appointments and approved leaves (research, administrative, parental).

2. Teaching assignments for budgetary cross appointments will be done in consultation with cross appointed unit's Chair/Director.

3. Recommendations for teaching assignments for faculty are developed by the Section Coordinators in discussion with the respective Section faculty members. Final teaching assignments are approved by the Chair with adjustments made to meet the teaching needs of the Department while ensuring a fair and equitable distribution of faculty workloads consistent with the workload policy outlined in this document.

4. The Department will attempt to find the courses that are the 'best fit' for each instructor while also recognizing the need for the Department to deliver a suitable number and variety of courses in all our

[1] Memo #51, 2010-11, http://www.provost.utoronto.ca/link/administrators/wlpp-2011.htm

1

programs and provide an equitable distribution of teaching load across the faculty. It is recognized that individual course assignments may change from time to time in response to changes in the Department faculty complement, research leaves, and major administrative assignments.

5. Teaching reduction or enhancement, will be considered by an advisory committee to the Chair, comprised of the Associate Chairs and the Chair. The following factors are among those considered, consistent with the Faculty Framework:
    a. All faculty are expected to make significant contributions to teaching (minimum 1 course equivalent)
    b. Normally one course maximum of teaching reduction or increase
        i. Teaching reduction is possible in the following circumstances:
            1. Major research activity such as leading a group proposal that is cross-disciplinary (e.g. NSERC Strategic Network, NCE, CFI, ORF Research Excellence, etc.)
            2. High graduate student supervisory responsibilities (Faculty guideline suggests number of graduate students financially supported by faculty member >10)
            3. Transfer of a faculty member's discretionary funds to the Department consistent with an amount agreed across the Faculty (e.g. 30k) provided that the instruction quality is maintained
            4. Significant service within the Dept/Faculty/University (associate chairs, leading CEAB efforts).
            5. NSERC Industrial Research Chairs with a reduced teaching load mandated in the terms of the Chair by NSERC
        ii. Faculty with an outstanding record of teaching may choose to increase their teaching component by one course. Consideration for reduction in graduate supervision or service workload could be based on such increased teaching intensity.

6. Teaching assistants will be assigned to undergraduate and graduate courses at a ratio of approximately one 54 hour TA per 25 students. It is expected that course instructors will adjust the TA workload in their courses to be consistent with this allocation. In exceptional cases, such as courses with labs, additional TA hours may be assigned on approval from the Chair.

Teaching for Teaching Stream Faculty:

1. While there are currently no teaching stream faculty in the Civil Engineering Department, the expectations for teaching stream workload are outlined for the possibility that teaching stream faculty might join the Department.

2. Teaching stream faculty are normally expected to carry double the teaching responsibilities of tenure stream faculty.

3. In assigning workload, consideration will be given to number of courses taught, coordination of multi-section courses, and contact time.

Service for Tenure and Teaching Stream Faculty:

1. It is the responsibility of the Chair to ensure that each faculty member is engaged in service in a way that: i) allows the Department/Faculty/University to function optimally; ii) encourages faculty to contribute and lead in the operation of the Department/Faculty/University; iii) allows each of its members to thrive in all aspects of their work; and, iv) is seen as a reasonable distribution of service workload among its members.

2

2. In assigning service workload, the Chair will consider various factors including: appropriate fit for individual and committee; normal workload for committees (heavy/light); balancing workload across the Department; Individual Initiative/Leadership/Commitment (e.g. chairing) of service activities.

3. Administrative positions (e.g. Chair, Associate Chairs) require serving on several committees associated with their positions that go beyond the normal load for faculty.

4. The service component for each faculty member should include several significant service roles for the Department in addition to several other service related tasks. Examples of significant service roles include: Section Coordinator, Department Academic Planning Committee; PTR Committee; Faculty Admissions Committee; Faculty Examinations Committee; Search Committees; Tenure Committees; UTFA representative; Awards Committee; Safety; Department Health and Safety Committee; NSERC Review Committee. It is recognized that the workloads are variable across the committees and that some roles such as committee chairs and section coordinators involve somewhat heavier workloads than committee membership. Given the number of service roles, number of faculty members, and service relief for research leaves, it is expected that each faculty member would have at least 2 significant service roles for the Department.

5. In addition to the above, Graduate faculty, including cross-appointed faculty, are normally expected to serve, on average, twice a year as chair of either a PhD qualifying, or an MASc bypass oral examination.

6. Graduate faculty are normally expected to serve as chairs of PhD Final Oral Examinations (FOE) in other Departments equivalently to the number of PhD students graduated under their supervision in the last academic year.

7. Faculty on an approved leave (e.g. research, administrative, parental) will have their service prorated, depending upon the percentage of the leave (e.g. 50% for six month leave)

8. In this document, service does not include the very many elements of service that are not routinely assigned by the Chair but that are also essential components of the operation of the Department/Faculty/University. Examples include: reading committees; adhoc task forces/committees; attending various student/dept functions; self directed service including representation on significant external committees/organizations within and outside Canada. Though these elements aren't explicitly covered by this policy, they are expected to be part of the workload of all faculty. They are considered in PTR and in exceptional cases may be considered for adjustments in service/teaching workload.

9. Reductions or enhancements of service workload, consistent with Faculty Framework:
   a. Reductions in service workload can be considered based on:
      i. Same factors considered for teaching service reduction.
      ii. Increased teaching responsibilities.
      iii. Significant curriculum development activity such as creating a new course, including lectures and labs.
   b. Significant enhancement in service intensity can be considered for reduction in teaching or graduate student advising.

APPENDIX A

Timing of Various Workload Assignments

- In the Winter of each year, the Section Coordinators begin the process of determining teaching assignments for the coming year in consultation with the faculty and the Chair
- Teaching assignments normally determined by June of each year recognizing that situations can arise where teaching assignments have to be adjusted during the year
- Process of determining major service/committee assignments begins late in the Winter Term.
- Service/Committee Assignments should normally be determined in time for various governance processes (e.g. May for Faculty Council) and, to the extent practicable, all major regular assignments determined in time for the Fall term. At this time each faculty member is notified in writing of his/her teaching and service requirements, as required by the University policy. As with all assignments, it is recognized that these may need to change during the year as situations arise.
- Teaching and assignments listed by course and service assignments listed by Task/Committee will be made available to all faculty. This should take place once per year (e.g. August) recognizing that it only covers relevant service assignments (e.g. Committee memberships) that are covered under this policy at that time and that assignments change and new ones arise during the year. A summary of the average teaching component per FTE should also be provided.
- Adjustments to service assignments made by the Chair as the needs arise during the year
- Each year, the Departmental PTR committee reviews (using annual activity reports) the service and teaching components for the academic year that just passed. Any substantial anomalies will be noted for the Chair's consideration in the following year.

Appendix B

Framework for Developing Unit Workload Policies

Faculty of Applied Science and Engineering

Introduction

This document provides guidelines for the creation of Unit Workload Policies in the Faculty of Applied Science and Engineering, as required by the University of Toronto Workload Policy and Procedures for Faculty and Librarians (WLPP). The policy as well as the PDAD&C Memo (#51, 2010-11) announcing the policy can be found at: http://www.provost.utoronto.ca/link/administrators/wlpp-2011.htm.

In a multi-Department Faculty such as ours, each Department and Institute will establish a Unit Workload Policy Committee, to be chaired by the respective Chair or Director, which will undertake a highly consultative approach to create a Unit Workload Policy. Each Unit Workload Policy must be approved by the Dean prior to implementation.

Current State

In the Faculty of Applied Science and Engineering, tenure-stream faculty workloads consist of three components: Research, Teaching and Service, with the typical corresponding percentage breakdown of 40/40/20. Teaching-stream faculty (Lecturer and Senior Lecturer) workloads consist of Teaching and Service, with the typical corresponding percentage breakdown of 80/20.

The **Research** component is primarily a self-directed aspect of the workload of tenure-stream faculty. The **Teaching** component is assigned by the Chair/Director (or their representative) of the unit and traditionally has consisted of 3 courses[2] per year, with 2 at the undergraduate level and 1 at the graduate level for tenure-stream faculty. **Service** is primarily internal to the unit, Faculty or University, but may also include external service to major professional associations and other organizations that are relevant to the mission of the unit.

Guidelines for Developing Unit Workload Policies

As a multi-Department Faculty it is essential that each Unit Workload Policy is established within a set of guidelines to ensure a level of consistency among the workload of all our faculty members. It is equally important that each Department/Institute has the flexibility to allocate workload in a manner that is appropriate for the unit and reflects the varied nature and intensity of the research, teaching and service activities undertaken by faculty members. As part of the creation of the Unit Workload Policies, each Department/Institute should define a baseline for what will be considered normal workload within the 40/40/20 (research, teaching and service) model for tenure-stream faculty, and the 80/20 (teaching and service) model for teaching-stream faculty.

Although all faculty members are accountable to contribute to each of the workload components (research, teaching and service for tenure-stream faculty; teaching and service for teaching-stream faculty), an adjustment to the annual workload percentage breakdown may be warranted (with the approval of the Chair/Director). Any such workload adjustment to the teaching component would apply to a maximum reduction or addition of one course per academic year and would be done at the discretion of the Chair/Director.

Working within the 40/40/20 and 80/20 models, each Unit Workload Policy will consider the normal level of activity within each component when defining circumstances under which a workload adjustment would be acceptable. For example:

[2] Courses refer to semester-long courses

1. **Research** will be considered self-directed and include activities such as, published work, scholarly addresses, grants and contracts, advising/mentoring graduate students[3] (Faculty average for research-stream graduate students is approximately 6 per faculty member), patents, industrial partnerships and collaborative research endeavours, and creative professional achievement.

   <u>Consideration for a teaching or service workload reduction based on research intensity could be made within the following circumstances:</u>

   - Major research activity, such as a group proposal that is cross-disciplinary in nature and is lead by the faculty member (examples could be, but are not limited to: NSERC Strategic Network, Network of Centres of Excellence, ORF Research Excellence).

   - Number of graduate students financially supported by the faculty member, exceeds 10.

   - Faculty member may use discretionary research funds to cover the teaching cost for a *maximum* of 1 course. For example, this could be done by transferring the teaching cost amount directly to the Department/Institute, or by covering the Department/Institute contribution to their graduate student stipends, up to the equivalent teaching cost amount. The course teaching amount will be consistent across the Faculty (ex. $30K/course).

2. A normal **teaching** component for tenure-stream faculty is 3 courses per year, with 2 at the undergraduate level and 1 at the graduate level, and a normal **teaching** component for teaching-stream faculty is 6 courses per year. Also included as part of the teaching responsibilities are aspects related to the servicing of teaching.

   <u>Consideration for a service workload **or** graduate student advising reduction based on teaching intensity could be made within the following circumstances:</u>

   - Significant curriculum development activity, such as creating a new course, including lectures and labs.

   - Faculty member with an outstanding record of teaching activities may choose to increase teaching responsibilities by one course.

3. **Service** is primarily to the Department/Institute, Faculty or University in the form of administrative duties and/or committee work, but may also include service to the profession in the form of Major participation or leadership role on association boards and government committees, granting agency review committees and editorial boards of major journals.

   <u>Consideration for a teaching workload **or** graduate student advising reduction based on service intensity could be made within the following circumstances:</u>

   - Significant administrative service within the Department/Institute, Faculty or University.

[3] While it is noted that graduate student supervision is identified as an aspect of teaching in the WLPP, it has traditionally been, and will continue to be, considered as part of the research component of a faculty member in the Faculty of Applied Science and Engineering. Our graduate programs are research-intensive and the students, who are financially supported through research grant funding, are an integral part of our research enterprise.

Appendix: C.3 Administrative Positions held by Civil & Mineral Engineering Faculty as of December, 2022

Faculty	Department Actitivies	FASE Activities	U of T/Community Activities
Baher Abdulhai	CivMin Graduate Studies Committee		
Bob Andrews			
Susan Andrews			
Fae Azhari			
Evan Bentz	Associate Chair, Undergraduate Studies - CIV CivMin Undergraduate Studies Committee Survey Camp- Session 2 Coordinator	Chair, FASE Undergraduate Curriculum Committee	
Constantin Christopoulos	Academic Director Structural Testing Facility		
Tamer El-Diraby			
Kamran Esmaeili	Research Theme Section Coordinator: Geotech/Mining Lassonde Scholarship Committee CivMin Space Committee CivMin Undergraduate Studies Committee		
Paul Gauvreau			
Mason Ghafghazi	CivMin Undergraduate Studies Committee		
Sebastian Goodfellow	CivMin Graduate Studies Committee		
Murray Grabinsky	CivMin Undergraduate Studies Committee	First Year Core 8 Committee	
Giovanni Grasselli			CivMin Representative, U of T Faculty Association (UTFA)
John Hadjigeorgiou	CivMin Academic Appeals Committee		
Sarah Haines	CivMin Graduate Admissions Committee	Chair, FASE Undergraduate Admissions Committee	
John Harrison	Associate Chair, Undergraduate Studies - LME CivMin Undergraduate Studies Committee	FASE Undergraduate Curriculum Committee	
Marianne Hatzopoulou	Associate Chair, Graduate Studies CivMin Graduate Studies Committee	Chair, FASE Engineering Graduate Education Committee	
Ron Hofmann	Research Theme Section Coordinator: Environmental CivMin Graduate Appeals Committee MEng Emphasis Coordinator: Advanced Water Technologies & Process Design		Faculty Advisor, U of T Chapter - American Water Works Association (AWWA)
Bryan Karney		Associate Dean, Cross-Disciplinary Studies (2009-2021)	
Daeho Kim		Member, FASE Inclusivity & Equity Advisory Committee	
Oh-Sung Kwon	CivMin Admissions Committee CivMin Graduate Studies Committee Survey Camp: Session 2 Coordinator		
Seungjae Lee		Member, FASE Teaching Methods & Resources Committee	
Heather MacLean		Vice-Dean, Strategic	
Oya Mercan	CivMin Graduate Admissions Committee CIVMIN Senior Promotions Committee	First Year Core 8 Curriculum Committee	

Faculty	Department Actitivies	FASE Activities	U of T/Community Activities
David Meyer	CivMin Graduate Studies Committee		Faculty Advisor, U of T Chapter - Engineers without Borders
Eric Miller			Member, School of Cities Advisory Committee
Khandker Nurul Habib	Research Theme Section Coordinator: Transportation Chair, CivMin Undergraduate Studies Committee	Member, FASE Academic Appeals Board (Undergraduate)	
Ibrahim Ogunsanya	CivMin Graduate Studies Committee	FASE Scholarships and Awards Committee	
Jeff Packer	CivMin Graduate Appeals Committee CivMin Senior Promotions Committee	CivMin Representative, FASE Senior Promotions Committee	
Daman Panesar	CivMin Capstone Design Course Coordinator	FASE Faculty Awards Committee FASE Multidisciplinary Capstone Design Project Coordinator	
Elodie Passeport	CivMin Graduate Scholarships Committee	Chair, FASE Teaching Methods & Resources Committee Lead, Early Career Engineering Faculty Group	
Karl Peterson	Research Theme Section Coordinator: Building Engineering Department Joint Health & Safety Committee Survey Camp: Session 1 Coordinator Advisor: Concrete Canoe Team		
Daniel Posen		Chair, FASE Undergraduate Assessment Committee	
Ayan Rezaei Rad			
Matt Roorda	Associate Chair, Research Survey Camp: Session 1 Coordinator	Member, FASE Research Committee	
Shoshanna Saxe			
Amer Shalaby	CivMin Graduate Studies Committee CivMin Senior Promotions Committee		
Shamim Sheikh	Speaker (Acting), Departmental Council		
Jeff Siegel			
Brent Sleep	Department Chair (Acting) Director, MEngCEM Program	FASE Chairs & Directors	Principals, Deans, Academic Directors, and Chairs (PDAD&C)
Marianne Touchie	CivMin Undergraduate Studies Committee		
Lesley Warren	Survey Camp: Session 1 Coordinator		

Appendix: C.3 Administrative Positions held by Civil & Mineral Engineering Faculty as of December, 2022

Appendix: C.4 Guidelines for Mentoring Junior Faculty

Department of Civil & Mineral Engineering
University of Toronto
GUIDELINES FOR MENTORING JUNIOR FACULTY

1 ALL JUNIOR FACULTY SHOULD BE MENTORED

Mentoring is essential for academic success and should begin as soon as possible. All instructors and assistant professors should receive mentoring in the form of
(1) academic process guidance and
(2) career guidance (also called professional development).

1.1 ACADEMIC PROCESS GUIDANCE INCLUDES:

1. Reviewing criteria for advancement in the mentee's series of appointment, including the requirements to be fulfilled to achieve favorable third-year and tenure reviews and promotion to Associate Professor.
2. Reviewing deadline dates for academic actions.
3. Reviewing the procedures regarding the review process at all stages.

1.2 CAREER GUIDANCE (PROFESSIONAL DEVELOPMENT) INCLUDES:

1. Assisting in time management and setting career priorities, goals and choices to judiciously balance research, teaching, management, clinical activities, and service to the department, University, professional organizations and the community.
2. Assisting in developing strategies to manage multiple demands on academic time, including knowing when to say "no".
3. Determining what the mentee must accomplish in a specific period of time to advance academically; supplying honest criticism about the current year as well as planning ahead; advising the mentee regarding what the department views as acceptable scholarship in the mentee's series.
4. Reviewing and critiquing manuscripts, abstracts, grant applications and presentations.
5. Providing advice on institutional and departmental allocation of physical resources, including space, core facilities, equipment, and appropriate staff support.
6. Suggesting ways to improve scholarly output, including advising on grant writing, facilitating the development of professional collaborations, and encouraging participation at professional meetings; making the mentee aware of competitive grants and other opportunities for research funding; assisting in linking the mentee with other people, locally and nationally, who share common scholarly interests.
7. Providing encouragement to promote excellence in teaching and suggesting ways for efficient use of time to make the maximum impact on students. Providing constructive criticism of the mentee's teaching performance based on a review of evaluations by students.
8. Providing encouragement and promoting individual recognition (e.g., nomination for awards), and advice on how to "showcase" one's work.
9. Suggesting ways to improve the organization of the Curriculum Vitae, including guidance on what to include and what to delete to avoid the charge of "padding".
10. Advising on the development and maintenance of an academic dossier, to include a list of referees to write letters of support for promotion, documentation of teaching responsibilities and evaluations, and a summary of committee participation.

2 MENTORING IS THE RESPONSIBILITY OF THE DEPARTMENT CHAIR

The department Chair should assume responsibility for the entire mentoring process.

2.1 ACADEMIC PROCESS GUIDANCE

Each new faculty member should be given an individualized counseling session regarding the academic process no later than 1 month after joining the faculty, and every 6 months thereafter. The Chair may choose to provide this guidance, or may designate one or two Professors who have been adequately prepared regarding the complex requirements of the academic system to perform this function.

2.2 CAREER GUIDANCE (PROFESSIONAL DEVELOPMENT)

The department Chair should assume responsibility for:
1. Identifying a mentor to guide the career and professional development of each member of the junior faculty.
2. Changing the mentor if the relationship with the mentee is unsatisfactory.
3. Documenting the dates of formal meetings between mentor and mentee to review progress.
4. Periodically surveying the junior faculty to determine the effectiveness of the mentoring process.

Mentoring thrives on <u>informal</u> continuous guidance. The frequency of informal conferences between mentor and mentee for career counseling should be left to the discretion of the mentor. Junior faculty members and their mentors should meet no less than twice a year to formally review progress, and the dates of these meetings should be documented. To preserve the necessarily confidential nature of discussions between the mentor and mentee, except perhaps for a statement of professional goals, the content of these discussions should not be revealed.

2.3 IDENTIFYING A MENTOR FOR CAREER GUIDANCE

1. The mentor should be an Associate Professor or Professor who has established a successful career in a field of common interest.
2. The junior faculty member ideally should identify his/her mentor as soon as possible, but no later than 6 months after joining the faculty.
3. The Chair (or his/her designate) should facilitate identification of the mentor by discussing with the member of the junior faculty the need for career guidance, and should ask him/her to designate a potential or current mentor.
4. The Chair (or designate) should communicate the mentee’s choice to the potential mentor, and document the approval of the mentor.
5. To clarify the responsibilities involved in mentoring, the new mentor should be provided with these guidelines.
6. Because departments collaborate in certain research areas, a mentoring relationship may develop between junior and senior faculty members in different departments. This should be encouraged, but the junior faculty member should also receive career guidance by a member of his/her own department’s faculty.

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Appendix: C.5 FASE Best Practices for Assessing Teaching Effectiveness in PTR Decisions

Appended to Report 3733R, February 27/23 FASE Council

FASE BEST PRACTICES FOR ASSESSING TEACHING EFFECTIVENESS IN PTR DECISIONS

This document was developed by the FASE Teaching Methods & Resources Committee (December 2022) and approved by FASE Council on February 27, 2023.

What is the purpose of this document, and who is the intended audience?

This document is intended for both PTR committees and faculty members and aims to promote some consistency in best practices across FASE in the evaluation of teaching effectiveness during annual PTR decisions. It references and builds upon the following key policy documents, which should be reviewed by both audiences during annual reviews:

GAET: FASE Guidelines for the Assessment of Effectiveness of Teaching in Tenure, Continuing Status and Promotion Decisions[1]

AAPM: U of T Academic Administrative Procedures Manual (PTR Section)[2]

What constitutes "teaching" and "teaching effectiveness" [for PTR]?

As described in GAET, teaching fundamentally includes *"lecturing, activity in seminars and tutorials, individual and group discussion, laboratory teaching, thesis and/or research supervision, and any other means by which students derive educational benefit."* AAPM notes that *"[t]eaching evaluation should not be confined just to the classroom or laboratory,"* and that PTR should recognize *"contributions such as the development of new courses or programs, contributions towards the development of a new curriculum, the integration of research into undergraduate and graduate teaching or superior performance as measured through such mechanisms as the course evaluation.*" AAPM further notes that *"[i]n assessing a faculty member's teaching, it is important to refer to the divisional guidelines,"* i.e., GAET.

GAET states that *"effective teaching aspires to provide to all students not only knowledge of facts but also the skills to analyze, to assess critically, to develop creative expression, to understand in context, to present arguments in a clear and compelling fashion, to solve problems, and to generate new knowledge."* Perhaps most importantly for PTR, GAET provides specific criteria that faculty members can use to demonstrate how these aspirations have been turned into action by way of teaching skills, educational leadership, and teaching initiatives. Individuals are therefore strongly encouraged to review GAET, especially sections A5 (Tenure Stream) and B5 (Teaching Stream) when filling their Annual Activity Report.

What should be included in the Annual Activity Report (AAR)?

Per AAPM, *"[t]he [AAR] should be more than just a listing of an individual's research and scholarship, teaching and service contributions."* FASE, therefore, strongly encourages the inclusion of a free-form self-assessment statement, summarizing the broader significance of one's teaching contributions and achievements within or beyond the university. Making specific reference to GAET's criteria and sub-criteria for teaching effectiveness in one's free-form statement is therefore helpful to PTR committees.

AAPM further notes that *"individuals should be clear on the changes in activity from the previous year and […] comment on the significance of their activities."* These may include things like new course design or changes within existing courses; goals you set for yourself in the previous academic year, and a measure of your performance towards achieving those goals; methods you used which helped you teach effectively, and how you used feedback to improve your teaching; how you incorporated your own current applications to cutting-edge research, etc.

FASE encourages experimentation and innovation in teaching, and so these should be described. FASE also encourages continuing development of teaching skills, and so individuals should describe any training (e.g., CTSI workshops, menteeship, etc.) they have undergone, and how they may have adapted their teaching/course to this.

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[1] https://www.engineering.utoronto.ca/files/2022/02/10-TMRC-Disc-DRAFT-Teaching-Effectiveness-Guidlelines.pdf

[2] https://www.aapm.utoronto.ca/academic-administrative-procedures-manual/academic-salary-administration/#PTR

Appended to Report 3733R, February 27/23 FASE Council

How should course evaluations be used when making PTR decisions?

First and foremost, PTR decisions should never be based on single ratings from course evaluations. As AAPM further notes, *"[i]n interpreting these course evaluations […] academic administrators should not merely refer to the numerical summaries."* Ratings should *always* be considered in the context of student comments, and the individual's AAR self-assessment and/or Teaching Dossier. Look for consistency in positive comments, especially those that may reinforce/reference specific criteria or sub-criteria in GAET. Consistently negative comments may be an important sign that the course needs adjustment; however, they may also be a warning sign of implicit or explicit bias, especially if they are inflammatory or *ad hominem*. Since course evaluations are solicited before final exams/grades, things like a tough midterm might bias ratings and comments downwards, so PTR committees should be wary of comments that focus exclusively on graded aspects of the course. There is also strong evidence in the literature that teaching evaluations are biased against women and members of marginalized groups.[e.g., 3,4]

Courses with substantial changes/innovation may also not be rated highly, at least initially, so course evaluations should *always* be viewed in context of instructor-described teaching innovations and self-assessment. The type of course and instructor role also provides important context, as AAPM notes: *"is the course new or repeated; is it compulsory or elective; is it introductory or advanced; is it multi-sectioned or individual and what role did the instructor play in its development; is it required for a program or optional; was the instructor experimenting with new teaching techniques, means of delivery, technology or material?"*

In conclusion, per AAPM, *"these kinds of considerations will encourage experimentation in teaching and ensure that no penalty will result from taking intellectual risks and recognize that many variables can be related to teaching evaluations by students."* That said, early-career faculty may understandably feel reluctant to experiment too broadly in their classroom teaching and should not be penalized for taking a cautious approach.

Is teaching effectiveness evaluated differently for tenure vs. teaching stream?

As detailed in GAET, criteria for *effectiveness* in teaching are broadly similar for tenure vs. teaching stream. For teaching stream, however, AAPM notes that *"[a] separate weighting of teaching, pedagogical/professional development and service should be made [and] faculty members shall be evaluated on their pedagogical and/or discipline-based scholarship in relation to the field in which they teach and/or creative/professional activity that allows the faculty member to maintain a mastery of their subject area and this evaluation will be appropriately weighted in the PTR assessment."*

More generally, for both streams, AAPM also notes, "*[t]he PTR scheme allows each unit to determine the balance amongst the three principal components of a faculty member's activities, teaching, research and service. This flexibility is important for recognizing the unique missions of units and the differences in agreed upon activities of individuals. […] Weighting of faculty members on research and study leave should reflect the research or pedagogical/professional development and/or discipline-based scholarship in relation to the field in which they teach and/or creative professional activity that allows the faculty member to maintain a mastery of their subject area[2] and service duties undertaken during their leave."*

Is student supervision evaluated in PTR as part of "teaching" or "research"?

According to the U of T Policy and Procedures on Academic Appointments (PPAA), *"Effectiveness in teaching is demonstrated in [. . .] situations such as counselling students and directing graduate students in the preparation of theses. It is, however, recognized that scholarship must be manifested in the teaching function and that a dogmatic attempt to separate 'scholarship' and 'teaching' is somewhat artificial"* (PPAA, III.13.b). Thus, in PTR decisions, for both tenure and teaching stream instructors, supervising undergraduate and graduate students may be considered as teaching *or* as research/scholarship, albeit with the understanding that a specific instance of supervision cannot be counted as both teaching and research/scholarship in an AAR. Additionally, teaching stream instructors may or may not be expected to supervise students, depending on their unit's curriculum and culture; thus, PTR committees should consider each instructor's situation individually.

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[3] Mengel et al. 2019, DOI: 10.1093/jeea/jvx057

[4] Kreitzer and Sweet-Cushman 2021, DOI: 10.1007/s10805-021-09400-w

Appendix: C.6 Awards and Distinctions Conferred on U of T Civil and Mineral Engineering Faculty, 2006 to Presents

Department of Civil and Mineral Engineering
Faculty Awards and Recognitions, December 2022

Faculty	Administrative/Leadership Awards and Professional Recognitions
Baher Abdulhai	Engineering Excellence Medal: Ontario Professional Engineers Awards (2021) Fellow: Canadian Academy of Engineering (2020) Sanford Fleming Award: Canadian Society for Civil Engineering (2018) Fellow: Engineering Institute of Canada (2016) Inventor of the Year Award: University of Toronto (2014)
Robert (Bob) Andrews	Fellow: Canadian Society for Civil Engineering (2018) Fellow: Engineering Institute of Canada (2018) Fellow: Canadian Academy of Engineering (2017) Albert E. Berry Medal: Canadian Society for Civil Engineering (2016) Julian C. Smith Medal: Engineering Institute of Canada (2011) George Warren Fuller Award: Ontario Water Works Association (2009) Alan Blizzard Award: Society for Teaching and Learning in Higher Education (2007)
Susan Andrews	George Warren Fuller Award: Ontario Water Works Association
Evan Bentz	Faculty Teaching Award: FASE (2013)
Constantin Christopoulos	Inventor of the Year: University of Toronto (2011) Young Engineer Achievement Award: Engineers Canada (2010)
Paul Gauvreau	Fellow: Canadian Society for Civil Engineering (2019)
Marianne Hatzopoulou	Brockhouse Canada Prize: National Sciences and Research Council of Canada (2021) *(in association with the Southern Ontario Centre for Atmospheric Aerosol Research (SOCAAR))*
Ron Hofmann	George Warren Fuller Award: Ontario Water Works Association (2022) Norman J. Howard Award: Ontario Water Works Association (2021)
Bryan Karney	Camille A. Dagenais Award: Canadian Society for Civil Engineering (2016) Northrop Frye Award: University of Toronto (2009) Fellow: American Association for the Advancement of Science (2009)
Heather MacLean	Julian C. Smith Medal: Engineering Institute of Canada (2018) Albert E. Berry Medal: Canadian Society for Civil Engineering (2017) Fellow: Canadian Academy of Engineering (2017) Fellow: Engineering Institute of Canada (2016) Excellence in Education Award: Canada Mortgage and Housing Corporation (2014)
Eric Miller	Safwat Zaky Research Leader Award: FASE (2020) Lifetime Achievement Award: International Association for Travel Behaviour Research (2018) Margolese National Design for Living Prize: University of British Columbia (2012) Wilbur Smith Disinguished Transportation Educator Award: Institute of Transportation Engineers (2009)
Khandker Nurul Habib	Sandford Fleming Award: Canadian Society for Civil Engineering (2020)

Department of Civil and Mineral Engineering
Faculty Awards and Recognitions, December 2022

Faculty	Administrative/Leadership Awards and Professional Recognitions
Jeff Packer	Alfred F. Wong Lifetime Achievement Award: Canadian Institute of Steel Construction (2022) A.B. Sanderson Award: Canadian Society for Civil Engineering (2019) Fellow: Engineering Institute of Canada (2019) Fellow: Canadian Society for Civil Engineering (2016) Fellow: American Association for the Advancement of Science (2016) Shortridge Hardesty Award: American Society for Civil Engineers (2012) Fellow: Canadian Academy of Engineering (2012) Ontario Professional Engineers Award: Research & Development (2010) Excellence in Innovation in Civil Engineering Award: Canadian Society for Civil Engineering (2009)
Elodie Passeport	Early Career Teaching Award: FASE (2020)
Shoshanna Saxe	Young Engineer Medal: Ontario Professional Engineers Awards (2019) Clean50 Emerging Leader: (2018): Corporate Knights
Amer Shalaby	Sandford Fleming Award: Canadian Society for Civil Engineering (2019)
Shamim Sheikh	Horst Leipholz Medal: Canadian Society for Civil Engineering (2018) Fellow: Engineering Institute of Canaada (2013)
Brent Sleep	Fellow: Canadian Society for Civil Engineering (2017) Fellow: Engineering Institute of Canada (2012)
Marianne Touchie	Early Career Teaching Award: FASE (2022) McCharles Prize for Early Career Research Distinction: FASE (2022) Rising Star Award: Ontario Building Envelope Council (2021)

Appendix: C.7 Awards and Distinctions Conferred on Emeritus and Retired Faculty, 2005 to Present

Department of Civil and Mineral Engineering
Awards and Distinctions - Emeritus Professors, December 2022

Faculty Member	Awards & Distinctions
Michael Collins	Order of Canada: Government of Canada (2022) Fellow: Royal Society of Canada (2011) Fellow: Canadian Academy of Engineering (2009) Fellow: Engineering Institute of Canada (2009)
Doug Hooton	Honorary Member: International Union of Laboratories and Experts in Construction Materials, Systems and Structures (2022) Fellow: Canadian Society for Civil Engineering (2020) Honorary Member: American Concrete Institute (2018) Julian C. Smith Medal: Engineering Institute of Canada (2016) Wason Medal for Meritorious Paper: American Concrete Institute (2015) Fellow: Réunion Internationale des Laboratoires et Experts des Matériaux (2014) Frank E. Richart Award: American Society for Testing and Materials (2013) Robert E. Philleo Award: American Concrete Institute (2013) Fellow: Canadian Academy of Engineering (2013) Research and Development Medal: Professional Engineers Ontario (PEO)/Ontario Society of Professional Engineers (2013) Fellow: Engineering Institute of Canada (2011) Arthur R. Anderson Medal: American Concrete Institute (2010)
Brenda McCabe	Vivek Goel Faculty Citizenship Award: University of Toronto (2021) Fellow: Engineering Institute of Canada (2017) Joan E. Foley Quality of Student Experience Award: University of Toronto (2015) Recognition Award: Senior Women Academic Administrators Canada (2013) Clear50: Corporate Knights (2011)
Kim Pressnail	Fellow: Ontario Building Envelope Council (2018) Excellence in Education Award for Promotion of Sustainable Practices: Canada Mortgage and Housing Corporation (2009)
R. Paul Young	International Secretary of the Royal Society of Canada (2020) Fellow: Royal Academy of Engineering (2018) Fellow: Institute of Materials, Minerals, and Mining (2016) Queen Elizabeth II Diamond Jubilee Medal: Government of Canada (2013) Fellow: American Association for the Advancement of Science (2011) Willet G. Miller Medal: Royal Society of Canada (2009) John A. Franklin Award for Rock Mechanics: Canadian Geotechnical Society (2005)
Frank Vecchio	Fellow: Engineering Institute of Canada (2022) Arthur J. Boase Award: American Concrete Institute (2020) A.B. Sanderson Award: Canadian Society for Civil Engineering (2020) Joe W. Kelly Award: American Concrete Institute (2016) Fellow: Canadian Society for Civil Engineering (2015) Horst Leipholz Medal: Canadian Society for Civil Engineering (2015) Research and Development Medal: Professional Engineers Ontario (PEO)/Ontario Society of Professional Engineers (2014)

Appendix: D Department of Civil and Mineral Engineering - Faculty Research Areas 2022-23 (listed by Research Theme)

Department of Civil and Mineral Engineering - Faculty Research Areas 2022-23 (By Research Theme)

Faculty	Thematic Research Group	General Research Focus	Primary Focus Areas	Cofocus Areas	Designations/Affiliations/Collaborations
Tamer El-Diraby	Building Engineering	Construction Project Management	Informatics and knowledge management (socio-semantic analytics)	Infrastructure asset management / building information modeling / smart city systems/ regenerative sustainability	Affiliate + Teaching and Learning Sub-Committee Member - President's Advisory Committee on Environment, Climate Change and Sustainability (CECCS) Affiliate - U of T Data Sciences Institute Network (DSI) Affiliate - U of T Mobility Network Affiiate - University of Toronto Transportation Research Institute (UTTRI) Affiliate - FASE Centre for Analytics and AI Engineering Affiliate - FASE Institute for Sustainable Energy
Sarah Haines	Building Engineering	Building Science	Indoor Environmental Quality	Indoor Microbiome Impact of the built environment on human health	Collaborative Project Co-Lead: U of T Connaught Global Challenge Award (2022) - "From Harvest to House - Developing a Pathway to Housing Self-sufficiency in Remote First Nations Communities" Project collaborators include researchers from U of T departments of Anthropology, Health & Society, ISTEP/ILead, Centre for Global Engineering, TMU-Architectural Science, Prince Albert Grand Council, Cree Nation, Wahpeton Dakota Nation, Montreal Lake Cree Nation
Daeho Kim	Building Engineering	Construction Management	3D reconstruction and digital twin of ongoing construction projects	Cohesive human-robot collaboration in construction	
Seungjae Lee	Building Engineering	Building Science	Optimal design and operation of building energy systems; Applied Artificial Intelligence (AI) technologies to realize Intelligent buildings	Human-building interaction Indoor environmental quality	Collaborating Researcher - U of T Climate Positive Initiative Affiliate - U of T Data Sciences Institute Network (DSI) Affiliate - U of T School of Cities Affiliate - FASE Centre for Analytics and AI Engineering
Ibrahim Ogunsanya	Building Engineering	Concrete Materials Metals and Alloys	Durability and sustainability of materials and reinforced structures Electrochemistry and corrosion	Material characterization techniques Cement and concrete chemistry	CIM-MetSoc Emerging Professional (2022) Member - American Concrete Institute Member - National Assoc. of Corrosion Engineers (NACE) International Member - Minerals, Metals and Materials Society (USA)
Daeho Kim	Building Engineering	Construction Management	3D reconstruction and digital twin of ongoing construction projects	Cohesive human-robot collaboration in construction	
Seungjae Lee	Building Engineering	Building Science	Optimal design and operation of building energy systems; Applied Artificial Intelligence (AI) technologies to realize Intelligent buildings	Human-building interaction Indoor environmental quality	Collaborating Researcher - U of T Climate Positive Initiative Affiliate - U of T Data Sciences Institute Network (DSI) Affiliate - U of T School of Cities Affiliate - FASE Centre for Analytics and AI Engineering
Ibrahim Ogunsanya	Building Engineering	Concrete Materials Metals and Alloys	Durability and sustainability of materials and reinforced structures Electrochemistry and corrosion	Material characterization techniques Cement and concrete chemistry	CIM-MetSoc Emerging Professional (2022) Member - American Concrete Institute Member - National Assoc. of Corrosion Engineers (NACE) International Member - Minerals, Metals and Materials Society (USA)

Department of Civil and Mineral Engineering - Faculty Research Areas 2022-23 (By Research Theme)

Faculty	Thematic Research Group	General Research Focus	Primary Focus Areas	Cofocus Areas	Designations/Affiliations/Collaborations
Daman Panesar	Building Engineering	Concrete Materials	Sustainability and durability of cement-based materials and structures	Investigation of new types of concrete to reduce environmental impact and extend service life of structures and infrastructure	Lead Investigator: Canada Green Building Council/U of T Partnership - "Burying Carbon in Buildings: Advancing Carbon Capture and Utilization in Cementitious Building Materials", with funding provided by Environment and Climate Change Canada's Climate Action ad Awareness Fund Collaborator - CivMin Seismic Resilience Group Affiliate - U of T Centre for the Sustainable Built Environment Member: Canadian Standards Association India-Canada Centre for Innovative Multidisciplinary Partnerships Professional affiliations: RILEM Technical Activities Committee - Convener, Cluster "A" Assistant Editor "Cement and Concrete Composites" Associate Editor - Canadian Journal of Civil Engineering Inaugural recipient: Erwin Edward Hart Professorship in Civil Engineering (2016-19)
Karl Peterson	Building Engineering	Concrete Materials	Microstructural analysis of concrete and other building materials	Sustainability	
Jeffrey Siegel	Building Engineering	Indoor Air Quality	Filtration forensics / Filtration performance Signal processing and ventilation Analysis and control of indoor microbiome, airborne particulate and nanoparticles	Sustainable energy systems design Utilization of artificial intelligence/machine learning in analyzing indoor environmental air quality	Bahen/Tanenbaum Chair in Civil Engineering, U of T Cross-appointed: Dept. of Physical & Environmental Sciences, UTSC* Cross-appointed: DLSPH - Occupational & Environmental Health Division* Affiliate - U of T Data Sciences Institute Network (DSI) Affiliate - FASE Centre for Analytics and AI Engineering Contributor: The OECD Forum Network Fellow - ASHRAE Member - Academy of Fellows of ISIAQ
Marianne Touchie	Building Engineering	Building Science	Monitoring and characterization of building energy performance Building environmental monitoring Examination of interactions between building energy use and indoor environmental quality	Development of advanced building retrofit solutions for multi-unit residential buildings Innovative applications of heat pump technology	Jointly appointed - Mechanical & Industrial Eng. Collaborating Researcher - U of T Climate Positive Initiative Affiliate - U of T Committee on the Environment, Climate Change and Sustainability (CECCS): Urban Issues Affiliate - U of T Data Sciences Institute Network (DSI) Affiliate - U of T School of Cities Affiliate - FASE Centre for Analytics and AI Engineering Affiliate - Centre for Climate Science and Engineering (CSE) Affiliate - Centre for Global Engineering (CGEN) Recipient - McCharles Prize for Early Career Research Distinction 2022 (U of T) Recipient - Rising Star Award, Ontario Building Envelop Council 2021 Past President - Building Science Specialist Board of Canada
Bob Andrews	Environmental Engineering	Drinking Water	Optimization in Drinking Water Treatment Processes / Water Quality in Distribution Systems	Disinfection to control pathogenic organisms	Collaborator - Drinking Water Research Group Affiliate - Institute for Water Innovation

Department of Civil and Mineral Engineering - Faculty Research Areas 2022-23 (By Research Theme)

Faculty	Thematic Research Group	General Research Focus	Primary Focus Areas	Cofocus Areas	Designations/Affiliations/Collaborations
Susan Andrews	Environmental Engineering	Drinking Water	Water quality and chemistry in water treatment processes	Novel and emerging byproducts of potential health concern	Collaborator - Drinking Water Research Group Affiliate - Institute for Water Innovation
Ron Hofmann	Environmental Engineering	Drinking Water Treatment Optimization	Disinfection and Oxidation Technologies	Microbiological systems Control of invasive species	Collaborator - Drinking Water Researh Group Affiliate - Institute for Water Innovation
Bryan Karney	Environmental Engineering	Sustainable Infrastructure	Design, analysis, operation and optimization of various water resource and energy systems	Pipe networks and water supply systems, including prediction of physical and chemical characteristics	Cross-appointed - ISTEP* Collaborating Researcher - U of T Climate Positive Initiative Affiliate - U of T School of Cities Affiliate - FASE Institute for Sustainable Energy Affiliate - FASE Centre for Resilience of Critical Infrastructure Affiliate - Institute for Water Innovation Associate Dean - Cross-Disciplinary Programs 2009-2021
Heather MacLean	Environmental Engineering	Sustainable Infrastructure	Systems analysis and life-cycle assessment Development of techno-economic methods incorporating uncertainty	Examination of bio-energy systems, conventional and unconventional fossil fuels Conventional and alternative light/medium duty vehicles	Canada Research Chair in Sustainable Systems and Techology Assessment Vice-Dean - Strategy, FASE Cross-appointed - ISTEP* Co-Research Director - Sustainable Systems Research Group Collaborating Researcher - U of T Climate Positive Initiative Affiliate - U of T Committee on the Environment, Climate Change and Sustainability (CECCS): Environment Affiliate - U of T Centre for the Sustainable Built Environment Affiliate - U of T U of T Mobility Network Affiliate - U of T School of Cities Affiliate - FASE Centre for Analytics and AI Engineering Affiliate - FASE Institute for Sustainable Energy Affiliate: Lassonde Institute of Mining Fellow - Canadian Academy of Engineering Fellow - Engineering Institute of Canada
David Meyer	Environmental Engineering	Groundwater	Modelling of water distribution networks within Global engineering context; Examination/assessment of Mega-City infrastructure	Incorporating use of AI/ invention of new methodologies, sensors for international development	Edwin Hart Professor in Global Engineering Jointly appointed - ISTEP Affiliate - U of T Data Sciences Institute Network (DSI) Affiliate - FASE Centre for Analytics and AI Engineering Affiliate - Centre for Global Engineering (CGEN) Affiliate - Institute for Water Innovation
Elodie Passeport	Environmental Engineering	Surface and Groundwater	Tracking of the fate, and development of methods for the removal of traditional and emerging organic and inorganic contaminants from the environment in natural and engineered systems	Examination and analysis of microplastics and microfibres in bioretention cells Development of new methods and more efficient solutions for surface and ground water remediation Incorporation of AI in water sample analysis	Canada Research Chair in Environmental Engineering and Stable Isotopes Jointly appointed: Dept. of Chemical Engineering Affiliate - Institute for Water Innovation Recipient Ontario Early Researcher Award (2021) Recipient FASE Early Career Teaching Award (2020)

Faculty	Thematic Research Group	General Research Focus	Primary Focus Areas	Cofocus Areas	Designations/Affiliations/Collaborations
Daniel Posen	Environmental Engineering	Sustainable Infrastructure	System-scale environmental sustainability analysis	Life cycle assessment Greenhouse gas mitigation strategies Alternative fuels and chemicals Quantitative analysis to guide environmental policy and decision making Data Management	Canada Research Chair in System-Scale Environmental Impacts of Energy and Transport Technologies Cross-appointed: ISTEP* Co-Research Director - Sustainable Systems Research Group Collaborating Researcher - U of T Climate Positive Initiative Affiliate - U of T Centre for the Sustainable Built Environment Affiliate - Centre for Climate Science and Engineering (CSE) Affiliate - U of T Mobility Network Affiliate - FASE Centre for Analytics and AI Engineering Affiliate - FASE Centre for Resilience of Critical Infrastructure Affiliate: Lassonde Institute of Mining Executive Committee Member: Int'l Symposium on Sustainable Systems and Technology Conference (2023)
Shoshanna Saxe	Environmental Engineering	Sustainable Infrastructure	Examination and analysis of construction resource use and embodied greenhouse gases Examination of travel behaviours and transit infrastructure	Examination of environmental implications and societal impacts of infrastructure Sustainable urban infrastructure	Canada Research Chair in Sustainable Infrastructure (Tier II) Co-Research Director - Sustainable Systems Research Group Collaborating Researcher - U of T Climate Positive Initiative Affiliate - U of T Committee on the Environment, Climate Change and Sustainability (CECCS): Urban Issues Affiliate - U of T Centre for the Sustainable Built Environment Affiliate - U of T Data Sciences Institute Network (DSI) Affiliate - U of T Mobility Network Affiliate - U of T School of Cities Member, Steering Committee - FASE Centre for Analytics and AI Engineering Member - Waterfront Toronto Capital Review Panel Member - Metrolinx Project Evaluation Advisory Panel
Brent Sleep	Environmental Engineering	Groundwater	Remediation of soil and groundwater contamination Computational methods for modelling environmental processes	Biological and chemical processes in soils Transport of pathogens in fractured rock aquifers	**Chair, Dept. of Civil & Mineral Engineering** **Director, MEngCEM Program** Affiliate - Institute for Water Innovation Affiliate: Lassonde Institute of Mining Fellow - Engineering Institute of Canada U of T Representative - Canadian Society for Civil Engineering Past Editor-in-Chief (Canada) - Journal of Contaminant Hydrology Past Associate Editor - Advances in Water Resources
Kamran Esmaeili	Mining/Geotechnical Eng.	Mine to Mill Process Optimization	Development of smart modeling solutions for the mining industry	Development of predictive 3D spatial models of rock mass properties	Robert Smith Chair in Geomechanical Mine Design and Analysis Affiliate - FASE Centre for Analytics and AI Engineering Affiliate: Lassonde Institute of Mining Adjunct faculty : Department of Earth & Environmental Sciences, University of Waterloo
Mason Ghafghazi	Mining/Geotechnical Eng.	Numerical and Physical Modelling of Geotechnical Processes	Constitutive Modelling of Soils/ Behaviour of Gravelly Soils	Assessment of liquefaction potential and post-cyclic response of tailings	Affiliate: Lassonde Institute of Mining

Department of Civil and Mineral Engineering - Faculty Research Areas 2022-23 (By Research Theme)

Faculty	Thematic Research Group	General Research Focus	Primary Focus Areas	Cofocus Areas	Designations/Affiliations/Collaborations
Sebastian Goodfellow	Mining/Geotechnical Eng.	(Experimental) Rock Mechanics and Rock Physics / Bioinformatics	Applied Seismology / Ultrasonic and Acoustic Emission Testing	Applied machine learning and data science	Affiliate - U of T Data Sciences Institute Network (DSI) Affiliate - FASE Centre for Analytics and AI Engineering Affiliate: Lassonde Institute of Mining Senior Research Associate - Laussen Labs-Hospital for Sick Children, Toronto
Murray Grabinski	Mining/Geotechnical Eng.	Mining and Geomechanics / Mining Engineering	Liquefaction of strong ground pond tailings mixed with binder (CPB)	Sustainable infrastructure	Affiliate - Institute for Water Innovation Affiliate: Lassonde Institute of Mining
Giovanni Grasselli	Mining/Geotechnical Eng.	Hydraulic Fracturing/ Rock Mechanics	Flow and transport in fractured porous media	Rock physics visualization techniques Mining survey and 3D visualization	NSERC - Energi Simulation Industrial Research Chair in Fundamental Rock Physics and Rock Mechanics (as of 2018) Previous - Inaugural holder of the Foundation CMG Industrial Research Chair in Fundamental Petroleum Rock Physics and Rock Mechanics (2016) Affiliate: Lassonde Institute of Mining
John Hadjgeorgiou	Mining/Geotechnical Eng.	Ground Support / Rock Mass Characterization	Behaviour of Veined Rock Masses / Surface Mining	Ore Pass Systems	Pierre Lassonde Chair in Mining Engineering Affiliate - Lassonde Institute of Mining Fellow, Canadian Institute of Mining, Metallurgy and Petroleum Board of Directors - Troilus Gold Corporation
John Harrison	Mining/Geotechnical Eng.	Mining Engineering Rock Mechanics	Rock Engineering		W.M. Keck Chair in Engineering Mechanics **Associate Chair-Undergraduate Studies - LME Program, Dept. of Civil & Mineral Engineering** Affiliate: Lassonde Institute of Mining
Lesley Warren	Mining/Geotechnical Eng.	Environmental assessment and reclamation of water resources associated with mining practices	Assessment and analysis of microbes, compounds and environmental conditions of mining wastewater Development of innovative solutions to facilitate mining wastewater remediation	Investigation of microbioal geochemistry and molecular microbiology of mine systems	Claudette Mac-Kay Lassonde Chair in Mineral Engineering Director - Lassonde Institute of Mining Affiliate - Institute for Water Innovation
Fae Azhari	Structural Engineering	Structural Health Monitoring	Sensor development/ Intelligent structures and systems	Decision analytics	Jointly appointed -Mechanical & Industrial Eng. Affiliate - FASE Centre for Analytics and AI Engineering
Evan Bentz	Structural Engineering	Numerical Modelling of Reinforced Concrete Behaviour	Technology transfer applications for research on shear and torsion	Service life modelling of reinforced concrete structures; analysis of ancient structures by modern methods	**Associate Chair-Undergraduate Studies, Civil Engineering, Dept. of Civil & Mineral Engineering** Collaborator - CivMin Seismic Resilience Group Affiliate - FASE Centre for Resilience of Critical Infrastructure Affiliate - U of T Committee on the Environment, Climate Change and Sustainability (CECCS) Affiliate - U of T Centre for the Sustainable Built Environment

Department of Civil and Mineral Engineering - Faculty Research Areas 2022-23 (By Research Theme)

Faculty	Thematic Research Group	General Research Focus	Primary Focus Areas	Cofocus Areas	Designations/Affiliations/Collaborations
Constantine Christopoulos	Structural Engineering	Critical Resilience	Development of self-centering seismic resistant systems	Development of wind, earthquake damping systems, seismic isolation and energy dissipation devices	Collaborator - CivMin Seismic Resilience Group Affiliate - FASE Centre for Resilience of Critical Infrastructure Affiliate - Centre for Global Engineering (CGEN)
Paul Gauvreau	Structural Engineering	Bridge Design	Development of new bridge systems; efficient use of new materials, and emerging reinforcement materials in bridge design	Sustainable bridge design; development of simple rational models for visualizing the flow of forces in reinforced and pre-stressed concrete structures	Affiliate - FASE Centre for Analytics and AI Engineering Provides consulting services to: Ministry of Transportation of Ontario, Ministere des transports du Quebec, industrial partners (i.e., Earth Tech Inc, McCormick Rankin Corp., BPR Inc.)
Oh-Sung Kwon	Structural Engineering	Structural Dynamics	Earthquake engineering; seismic soil-structure interaction	Hybrid simulation (experiment-analysis)	Collaborator - CivMin Seismic Resilience Group Affiliate - FASE Centre for Resilience of Critical Infrastructure Affiliate - FASE Centre for Analytics and AI Engineering
Oya Mercan	Structural Engineering	Seismic Resilience	Development of advanced simulation techniques to assess seismic activity of structures	Dynamic behaviour of complex structures	Edwin Hart Professor of Civil and Mineral Engineering Director-Centre for Climate Science and Engineering (CSE) Collaborating Researcher - U of T Climate Positive Initiative Collaborator - CivMin Seismic Resilience Group Affiliate - FASE Centre for Resilience of Critical Infrastructure Affiliate - U of T School of Cities
Jeffrey Packer	Structural Engineering	Steel Structures	Experimentation and analysis of behaviour and design of tubular steel structures	Manufacturing standards and design specifications for hollow structures Rehabilitation and repair of infrastruture Steel wind turbine towers	Collaborator - CivMin Seismic Resilience Group Affiliate - FASE Centre for Resilience of Critical Infrastructure Collaborative research with: Ecole Polytechnique Montreal, Karlsruhe Inst. Of Technology (Germany); Delft University of Technology (Netherlands), Monash University (Australia), Nanyang Technological University (Singapore), National University of Singapore, Insrael Institute of Technology
Aryan Rezaei Rad	Structural Engineering	Sustainable Structures (Timber Structures)	Design of structural systems utilizating sustainable materials Integrating advanced computational methods and digital technologies into structural systems design Furthering and facillitating technology transfer of sustainable structural design applications	Simulation based engineering science Design of discrete structural assemblies Physical modelling of structures	Education /Collaboration: Ecole Polytechnique Federal de Lausanne (EPFL) Swiss National Science Foundation-National Centre for Competence in Research Digital Fabrication (SNSF-NCRR) Member (Civil Engineer) - Swiss Society of Engineers and Architects (SIA)

Department of Civil and Mineral Engineering - Faculty Research Areas 2022-23 (By Research Theme)

Faculty	Thematic Research Group	General Research Focus	Primary Focus Areas	Cofocus Areas	Designations/Affiliations/Collaborations
Shamim Sheikh	Structural Engineering	Seismic Resilience	Behaviour and design of reinforced concrete structures Performance-based seismic design	Effect of climate change on (reinforced) concreted structures Seismic upgrade and rehabiitation of existing structures Development of improved design procedures and new materials for resilient infrastructure	Fellow - Canadian Academy of Engineering
Baher Abdulhai	Transportation Eng.& Planning	Traffic Management	Intelligent Transportation Systems/ Emerging Technologies in Transportation		Co-Director - Centre for Automated and Transformative Transportation Systems (CATTS) Affiliate - U of T Committee on the Environment, Climate Change and Sustainability (CECCS) Affiliate - U of T Mobility Network Affiliate - U of T Data Sciences Institute Network (DSI) Affiliate - FASE Centre for Analytics and AI Engineering
Marianne Hatzopoulou	Transportation Eng.& Planning	Environmental Analysis: Traffic-related Air Pollution / Urban Air Quality	Transportation Engineering	Transportation planning	Canada Research Chair in Transport Decarbonization and Air Quality **Associate Chair-Graduate Studies, Department of Civil & Mineral Engineering** Director - Positive Zero Transport Futures Head - Air Quality Group, U of T Data Sciences Institute: Research and Academics Committee Collaborating Researcher - U of T Climate Positive Initiative Researcher - Centre for Automated and Transformative Transportation Systems (CATTS) Researcher - City Logistics for the Urban Economy (CLUE) Affiliate - Centre for Climate Science and Engineering (CSE) Affiliate - U of T Mobility Network Affiliate - U of T School of Cities Affiliate - GTHA Smart Freight Centre Head - Transportation and Air Quality Research Group (TRAQ) Contributor: The OECD Forum Network

Department of Civil and Mineral Engineering - Faculty Research Areas 2022-23 (By Research Theme)

Faculty	Thematic Research Group	General Research Focus	Primary Focus Areas	Cofocus Areas	Designations/Affiliations/Collaborations
Eric Miller	Transportation Eng.& Planning	Integrated Land Use and Transport Modelling	Development and application of microsimulation modelling systems within large urban contexts	Land-use systems Sustainable urban design Big data management (i.e., municipal traffic flows/transportation patterns)	Director - U of T Mobility Network Founder and Director - University of Toronto Transportation Research Institute Research Director - U of T Data Management Group Researcher - Centre for Automated and Transformative Transportation Systems (CATTS) Collaborating Researcher - U of T Climate Positive Initiative Affiliate - U of T Committee on the Environment, Climate Change and Sustainability (CECCS): Urban Issues Affiliate - U of T School of Cities Affiliate - FASE Centre for Resilience of Critical Infrastructure Contributor - National Reseearch Council Energy Modelling Initiative
Khandker Nural Habib	Transportation Eng.& Planning	Integrated Land Use and Transport Modelling	Integrated and sustainable transportation and land use planning /qualitative and quantitative evaluation of planning/policy options	Land-use and travel demand modelling	Percy Edward Hart Professor in Civil and Mineral Engineering Associate Director - U of T Data Management Group Researcher - Centre for Automated and Transformative Transportation Systems (CATTS) Collaborating Researcher - U of T Climate Positive Initiative Affiliate - U of T Mobility Network Affiliate - U of T School of Cities Affiliate - FASE Centre for Analytics and AI Engineering Past Chair - TRB Standing Committee on Traveler Behaviour and Values (USA)
Matt Roorda	Transportation Eng.& Planning	Freight Management	Urban freight data analysis and modelling Freight optimization Passenger transportation analysis	Development of sustainable and efficient urban transportation systems Determining new approaches for sustainable movement of goods and services in last mile delivery	Canada Research Chair in Freight Transportation and Logistics **Associate Chair - Research, Dept. Civil & Mineral Engineering** Chair, Scientific Advisory Committee - Smart Freight Centre (GTHA) Principal Investigator - City Logistics for the Urban Economy (CLUE) Researcher - Centre for Automated and Transformative Transportation Systems (CATTS) Affiliate - U of T Mobility Network Affiliate - U of T School of Cities
Amer Shalaby	Transportation Eng.& Planning	Public Transportation Operations and Planning	Development of Intelligent transportation systems	Simulation and modelling of transportation systems	Bahen/Tanenbaum Chair in Civil Engineering, U of T Co-Director - Centre for Automated and Transformative Transportation Systems (CATTS) Head - Transit Analytics Lab Affiliate - U of T Mobility Network Affiliate - U of T Data Sciences Institute Network (DSI) Affiliate - U of T School of Cities International Associate - Public Transport Research Group (Australia) Fellow Canadian Society of Civil Engineering Associate Editor - Canadian Journal of Civil Engineering

Appendix: E Department of Civil and Mineral Engineering Constitution

Civil & Mineral Engineering
UNIVERSITY OF TORONTO

CONSTITUTION OF THE DEPARTMENTAL ACADEMIC COUNCIL

TABLE OF CONTENTS

1 Definitions 2
2 General Powers, Duties and Responsibilities 2
3 Specific Powers and Duties OF COUNCIL 3
4 Membership 3
5 Meetings 3
6 Standing Committees 4
6.1 GENERAL 4
6.2 UNDERGRADUATE STUDIES COMMITTEE (USC) 4
6.2.1 Membership 4
6.2.2 Functions 5
6.3 GRADUATE STUDIES COMMITTEE (GSC) 5
6.3.1 Membership 5
6.3.2 Functions 5
6.4 GRADUATE ADMISSIONS COMMITTEE (GAC) 6
6.4.1 Membership 6
6.4.2 Functions 6
6.5 GRADUATE ACADEMIC APPEALS COMMITTEE (GAAC) 6
6.5.1 Membership 6
6.5.2 Functions 6
7 Method of Elections 6
8 Amendment 7

Version History
Original Constitution Adopted June 6, 1995
Amended proposed January 19, 2011; Approved May 25, 2011
Amended proposed and Approved October 5th, 2016

1 DEFINITIONS

In this constitution:

Department	Department of Civil & Mineral Engineering
Council	the properly composed Academic Council of the Department of Civil & Mineral Engineering
Teaching Staff	a member of the Department who holds an academic appointment of 25% or more in the Department
Administrative Staff	an appointed staff member of the Department who is not a member of the teaching staff and who holds an appointment of 25% or more
Undergraduate Student	any student registered in the Civil (CIV) or Lassonde Mineral Engineering (LME) programs of study leading to a Bachelor's degree
Graduate Student	any student registered with the School of Graduate Studies and in the Department in a program of study leading to a Master's or PhD degree
Sections	Administrative groups that are assigned by the Chair of the Department

2 GENERAL POWERS, DUTIES AND RESPONSIBILITIES

(i) Council shall determine its composition, including the number, compositions and authority of committees of Council, subject to the provisions of the *University of Toronto Act 1971*, as amended.

(ii) Council has authority for the academic policies and programs of the Department subject to the approval of such policies and programs, when required, by the Faculty of Applied Science and Engineering and the School of Graduate Studies. Academic policy sets out the principles for, the general direction of, and/or priorities for the teaching and research activities of the Department.

(iii) Council may delegate authority to a committee of Council; however, decisions of committees of Council must be reported to Council.

(iv) In matters concerning resources and resource allocation, Council plays an advisory role, tendering advice to the Chair of the Department.

3 SPECIFIC POWERS AND DUTIES OF COUNCIL

The specific powers and duties of Council are:

(i) formulating and approving departmental policies and programs regarding undergraduate academic matters, for referral, where required, to the Committees and Council of the Faculty of Applied Science and Engineering;

(ii) formulating and approving departmental policies and programs regarding graduate academic matters, for referral, where required, to the Engineering Graduate Education Committee of the Faculty of Applied Science and Engineering and/or the School of Graduate Studies; and

(iii) reviewing the implementation of the policies created under (i) and (ii).

4 MEMBERSHIP

(i) All teaching staff.

(ii) Two Civil Engineering and two Lassonde Mineral Engineering undergraduate student representatives and three graduate student representatives elected by and from within the respective student bodies annually, no later than two weeks after the start of the fall term.

(iii) All Directors and Managers within the Department as ex-officio, non-voting members of Council.

5 MEETINGS

(i) Meetings of Council will be presided over by a Speaker elected by and from within the Council for a three-year term. The Speaker shall be responsible for enforcing the rules of procedure as established by the Council of the Faculty of Applied Science and Engineering and may not be Chair of any standing or ad hoc committee of Council.

(ii) Council shall meet at least twice per year at the call the Speaker. In addition, Council will meet upon the written request to the Speaker by at least six members of Council. There shall be at least one week's notice of this requested meeting.

(iii) The quorum for a meeting of Council will be one-third of the membership. Members may attend remotely using appropriate means and will therefore be counted as part of the quorum.

(iv) In accordance with University regulations concerning graduate studies, only members of the School of Graduate Studies are eligible to vote on matters of business associated with graduate studies.

6 STANDING COMMITTEES

There are four standing committees of Council:

- Undergraduate Studies Committee
- Graduate Studies Committee
- Graduate Admissions Committee
- Graduate Academic Appeals Committee

6.1 GENERAL

(i) The Chair of the Department is an ex-officio voting member of all committees of Council.

(ii) Members of Council may attend all standing committee meetings as observers, but may be asked to withdraw at the sole direction of the committee Chair.

(iii) The quorum for a meeting of a standing committee will be one-half of the membership. Members may attend by conference call, which will therefore be counted as part of the quorum. A standing committee may, at the sole discretion of the committee chair, discuss and vote on by email or other electronic means a specific routine matter that falls within policies and procedures established by Council; in such cases, a positive vote of two thirds of all eligible members of the committee is required to pass a proposal, and the vote on the matter shall be reported to the members by the chair of the committee.

6.2 UNDERGRADUATE STUDIES COMMITTEE (USC)

The USC represents and considers all matters pertaining to the undergraduate Civil and Lassonde Mineral Engineering Programs including 500 level courses that are offered to both undergraduate as well as graduate students.

6.2.1 Membership

(i) The Chair of the Department or his/her designate.

(ii) Three teaching staff members appointed by the Chair affiliated with the Civil Engineering program, including the Associate Chair for the Civil Engineering program and the representative of the Civil Engineering program on the Faculty Curriculum Committee.

(iii) Three teaching staff members appointed by the Chair affiliated with the Lassonde Mineral Engineering program, including the Associate Chair for the Lassonde Mineral Engineering program and the representative of the Lassonde Mineral Engineering program on the Faculty Curriculum Committee.

(iv) Two undergraduate students each from the Civil Engineering and the Lassonde Mineral Engineering programs who may be members of Council. Student representatives of the USC may have a designated alternate who may be a member of Council.

(v) The majority of the members of the USC shall be licensed Professional Engineers in Canada, preferably by Professional Engineers Ontario.

6.2.2 Functions

The USC is responsible for monitoring, reviewing and proposing (for Department Council's consideration) revisions to the Civil and Lassonde Mineral Engineering Programs.

Changes to 500 level courses shall be carried out in consultation with the Graduate Studies Committee.

6.3 GRADUATE STUDIES COMMITTEE (GSC)

The GSC represents and considers all matters pertaining to the graduate Civil Engineering curriculum. The GSC is also responsible for administering all applicable regulations and policies of Council and the School of Graduate Studies as they pertain to graduate students and their programs of study and research.

6.3.1 Membership

(i) The Chair of the Department or his/her designate and the Graduate Associate Chair.

(ii) One teaching staff member from each of the Sections of the Department appointed by the Chair of the Department in consultation with the Section Coordinator, who are members of the School of Graduate Studies.

(iii) Two graduate students elected within the first two weeks of the fall term by and from within the Civil Engineering graduate student body.

6.3.2 Functions

(i) The GSC is responsible for monitoring, reviewing, and proposing (for Academic Council's consideration) revisions to the Civil Engineering graduate curriculum.

(ii) The GSC is also responsible for administering all applicable regulations and policies of Council and the School of Graduate Studies with respect to graduate students, from the time a student first registers in a graduate program until they terminate their registration with the School of Graduate Studies. In matters not involving curriculum, the Committee has the power to act on behalf of the Department, and reports directly to the Chair of the Department except concerning matters that require direction from the Council. On routine matters, it may in turn delegate its authority to a subcommittee consisting of the committee Chair and the appropriate Associate Chair, or their designates. In particular, this committee shall:

(a) decide requests for the reclassification of students between graduate programs (M.A.Sc., M.Eng. and Doctoral);
(b) approve a Ph.D. student's programme of study;
(c) approve the membership of a student's Ph.D. Comprehensive Examination Committees in consultation with the student's supervisor or co-supervisors;
(d) approve the membership of PhD Advisory Committees concurrently with the scheduling of a student's comprehensive examination committee;; Approve the

membership of a student's Ph.D. Examination Committee upon the request of the student's supervisor or co-supervisors; and

(e) report to Council on students completing graduate degrees within the Department and Include this information in reports to Council.

6.4 GRADUATE ADMISSIONS COMMITTEE (GAC)

6.4.1 Membership

(i) The Chair of the Department or his/her designate and the Graduate Associate Chair.

(ii) One teaching staff member from each of the sections of the Department selected from and by the Chair of the Department in consultation with the Section Co-ordinator.

6.4.2 Functions

This Committee administers all graduate admission matters according to the policies formulated by the Council. The Committee has power to act on behalf of the Department and generally reports directly to the Chair of the Department except concerning matters that require direction from the Council. In particular, the Committee will rule on the admissibility of applicants to graduate programs.

6.5 GRADUATE ACADEMIC APPEALS COMMITTEE (GAAC)

6.5.1 Membership

(i) This committee shall be constituted according to the rules established by the School of Graduate Studies.

6.5.2 Functions

(i) To hear and decide upon graduate student appeals of academic decisions.

7 METHOD OF ELECTIONS

(i) Individual nominations for the position of Speaker shall be made in writing by teaching staff members of Council by May 31 of the year in which the two year term of the incumbent Speaker ends.

(ii) The newly-elected Speaker and the new members of all committees will take office July 1st.

(iii) A member may decline nomination to the position of Speaker. Further, in special cases permission may be granted, by the Chair, to a nominee to withdraw their name.

(iv) No member of the Department, other than the Chair or his/her designate, shall be a member of more than two committees of Council, nor be Chair of more than one.

(v) Each committee will elect its own Chair by secret ballot from among the non ex-officio members.

(vi) Membership on a standing committee of the Council will be for a two-year term, and there is no restriction on a committee member being nominated for re-election. Student members of Council and of the USC and GSC are elected by their constituents annually.

(vii) Any vacancy occurring in the committees after they are formed will be filled by appointment by the Chair of the Department until the next regular election.

8 AMENDMENT

This Constitution shall be amended only if:

(i) a motion to amend the Constitution has been circulated to all members of Council, not less than 14 days prior to the regular meeting of Council, and

(ii) the motion is heard, and any amendments to the original motion are accepted by not less than two thirds of the members present, and

(iii) the motion as amended is accepted by not less than two thirds of the members present.

Appendix: F Policy on Management of Departmental Space

Civil & Mineral Engineering Department Policy on Management of Department Space

1.0 Terms of Reference

1.1 This space management policy provides a set of guidelines to govern the management of space within the Department of Civil & Mineral Engineering (CIVMIN). The policy was developed in the spirit of fair allocation of space in a space-constrained system in which yearly costs are about 20% of the Departmental budget ($355/nasm in the 2015 fiscal year).

1.2 The policy has been developed based on the recommendations of the Council of Ontario Universities (COU) standards, where applicable, as guidelines on the amount of space to be used for a specific purpose.

1.3 Existing space policies of other FASE Departments were taken into consideration at the time of developing this policy document[1-4].

2.0 Governing Principles

2.1 In accordance with the principles of space allocation at the University of Toronto, which was approved by Planning and Budget, Campus and Facilities Planning Committee, the Chair of the Department is responsible for space allocation within the Department. Space allocations will be recommended by the CIVMIN Space Management Committee (SMC) based on the policy described within this document. The CIVMIN SMC will consist of the Section Coordinators of the Department. The Department Chair will consider the relative merits of several factors and data as outlined below, when considering a recommendation for space allocation or re-allocation.

2.2 The assignment of space is carried out in accordance with the set of policies set out in this document. Modifications to these policies and procedures can be made in the future and should be circulated for discussion and feedback to the CIVMIN SMC and then the Department as a whole.

2.3 Members of the Department will cooperate and share space whenever possible in order to make the maximum possible use of our physical facilities.

2.4 Members who are assigned space have the responsibility to ensure that, when they no longer need assigned space, they notify the Chair that their space, or a portion of their space, is available for re-assignment. The Chair may independently request information about the use of space. The Chair may re-assign space, typically under advice of the SMC. A space review will be performed annually or as needed.

2.5 Members of the Department recognize that the physical space belongs to the Department and changing circumstances of the Department and University may occasionally require alterations to arrangements previously agreed to.

3.0 Office Space

3.1 All office space is managed by the Department through coordination with the Section Coordinators who comprise the SMC. While coordination is through the Section Coordinators, space is not strictly reserved for any individual section but will be allocated to ensure the optimal use of space subject to the priorities outlined in this document. Coordination of space by the SMC will be assisted by the Infrastructure Coordination Assistant (ICA) who will maintain a Departmental space database.

3.2 The COU recommends an office space of 12 NASM for full time faculty members. In this Department, these standards are met and in some cases exceeded.

3.3 Office space for full-time research associates (RA), and research project managers (RPM) will be will be based on the University guideline of 4 nasm/FTE and will typically be space shared with other RAs and RPMs. Casual USW employees (short term hires, summer students) will not generally be given dedicated office space or desks. Requests for office space allocation for RAs and RPMs should be made before a letter of offer is extended. The request for RA/RPM office space should be forwarded by the supervising PI to the appropriate Section Coordinator who will seek approval by the SMC. Allocation of office space for RAs/RPMs will take into consideration office space needs for PDFs and graduate students.

3.4 With respect to PDFs and graduate students, full time UofT PhD students and PDFs have first priority on desk space. MEng students will not generally be assigned office space but have access to the study space adjacent to the Civil Graduate Student Common Room. Office space allocation for graduate students and PDFs will be based on the University guideline of 4 nasm/student. While office space for graduate students and PDFs will typically be allocated in a manner to facilitate proximity to supervisors and the relevant research infrastructure, consideration of the space needs across the Department will be considered in any allocation of space for PDFs and graduate students. Requests to hire PDFs are handled by the ICA and approved by the Chair.

3.5 Any personnel (RAs, RPMs, PDFs, graduate students) not using desks more than one day per week must share desks. Students who have graduated must relinquish their desks within 6 weeks of completion of their degree requirements. Any exception to this policy for an individual who may be completing follow-up work beyond their degree program or appointment in the Department (manuscript preparation for example) must be approved by the SMC and will be considered a low priority with respect to other needs for space outlined in Sections 3.3 and 3.4.

3.6 Visiting professors who will be here longer than one month must be registered with the Department as visiting professors. To be accepted as a visiting professor in the Department, approval of the Chair and Dean is required. Space will not be allocated to visiting professors who are not registered. Office space to accommodate visiting professors is very limited and generally will be of similar quality as that allocated to graduate students, if such space is available. Provision of office space to visiting professors is lower priority than provision of space to RAs, RPMs, PDFs, and graduate students. Requests to host visiting professors should be made to the Chair, at the time of invitation and well in advance of the arrival of the visitor. Such requests should include confirmation from the appropriate Section Coordinator and the SMC that office space is available, subject to the priorities with respect to office space as outlined in this document.

3.7 Visiting international graduate students must be registered with the School of Graduate Studies in the International Visiting Graduate Student Research (IVGSR) program. Requests for office space for IVGSR students should be forwarded by the prospective supervising PI to the appropriate Section Coordinator who will seek approval by the SMC and the Chair. This must be done before extending an invitation to an IVGSR student. UofT PDFs and registered UofT graduate students have priority over IVGSR students. Provision of office space to IVSGR students is lower priority than provision of space to RAs, RPMs, PDFs, and graduate students.

3.8 For Professors Emeriti, who remain active in the mission of the Department, the Department will provide office space, as well as research space in the form of graduate student seating and laboratory space. Faculty members in the year prior to their retirement will inform the Chair of their desire for space in the Department following their retirement. The Chair will attempt to meet those needs. As with all other faculty, the assessed use of the space, including the office space, will be used to judge whether the allocation of space is appropriate.

3.9 Any changes in utilization of space must be approved by the SMC. Such changes include a change in personnel category that involves a change in space allocation priority (e.g. from UofT graduate student to visiting professor or IVSGR student), desks becoming free with no near term upcoming occupancy of the space by the same personnel category, any change in the per nasm space assignment in an office, any change in the usage of office space that affects the number of spots available for personnel, etc.

4.0 Research Space

4.1 Research space is allocated on the basis of “research activity” as defined in Sec. 4.2. It should be noted that research space is not solely allocated on the basis of research funding.

4.2 Research activity is a measure of the research activity being carried out by a faculty member of the CIVMIN Department and will be quantified by one or a combination of the following factors: the number of active salaried full time employees working on research; grants and contracts (peer and non-peer reviewed will be considered); the number of full time trainees under the direct supervision of the faculty member; the number of summer students or casual trainees under the direct supervision of the faculty member and the physical infrastructure acquisitions managed by the faculty member.

4.3 Current guidelines for the assignment of laboratory space is set at 10 NASM/FTE, where FTE is a full time employee, research associate, post-doctoral fellow or graduate student trainee, plus the equivalent of at least 4 nasm/FTE of office space, as appropriate. Summer student or casual trainee is equivalent to 0. 5 FTE.

4.4 The allocation of research space is not restricted on the basis of professorial rank or tenure status.

4.5 In the case of new hires, the measure will reflect the potential for research activity.

4.6 An allocation of research space grants the faculty member the right to use and manage the space in order to carry out research. Any permanent modifications to the space (i.e. bench changes, plumbing, electrical, ventilation, etc.) must be first approved by the CIVMIN SMC and the Chair and, when appropriate, the Departmental Health and Safety Committee. Unless otherwise specified, all renovation costs will be the responsibility of the faculty member making the request.

4.7 All faculty members applying for grants or negotiating contracts that require additional space beyond their current allocation must make an explicit written/email request to the Chair for the required space prior to an actual grant application or contract commitment.

4.8 Continued use of laboratory space by any faculty member(s) (tenured, tenure-stream, or emeritus) will require continuing activity, as determined by the SMC and in consultation with the faculty member(s). The Chair, in consultation with the SMC, will monitor space usage with regular audits.

4.9 Faculty members are responsible for ensuring that research activities under their supervision are conducted in a safe manner in compliance with University and Department policies and all government regulation.

5.0 Common Space

5.1 Centralized laboratories for graduate and undergraduate research and teaching that serve all members of the Department will be formally established under the control of the Chair and to be assigned as needs arise.

5.2 Other Departmental common space such as: support staff offices, UG teaching laboratories, UG and Grad student common rooms, student design team lab(s), computer lab and storage rooms will be under the control of the Chair.

6.0 References

1. ECE Space Management Policy, September 5, 2005.

2. MIE Space Management Policy, October 14, 2011.

3. IBBME Policy on Assignment of Laboratory Space, September 26, 2013.

4. MSE Space Management Policy, June 25, 2014.

PROVOSTIAL SUPPLEMENTAL DOCUMENTATION

University of Toronto Library Report

UNIVERSITY OF TORONTO LIBRARIES

University of Toronto Libraries Report for Department of Civil & Mineral Engineering, Faculty of Applied Science & Engineering, January 21, 2022

Context: The University of Toronto Library (UTL) system is the largest academic library in Canada and is currently ranked third among academic research libraries in North America.[1] The UTL has an annual acquisition budget of $42.5 million. Its research and special collections comprise over 12.4 million print volumes, 5.6 million microforms, over 5,000 print journal subscriptions, and rich collections of manuscripts, films, and cartographic materials. The system provides access to more than 2.8 million electronic books, 182,000 electronic journals, and rich primary source materials.[2] Numerous, wide-ranging collections, facilities and staff expertise reflect the breadth of research and instructional programs at the University and attract unique donations of books and manuscripts from around the world, which in turn draw scholars for research and graduate work.

Major North American Research Libraries					
	2015-2016	**2016-2017**	**2017-2018**	**2018-2019**	**2019-2020**
ARL RANK	**UNIVERSITY**	**UNIVERSITY**	**UNIVERSITY**	**UNIVERSITY**	**UNIVERSITY**
1	Harvard	Harvard	Harvard	Harvard	Harvard
2	Yale	Yale	Yale	Yale	Yale
3	Michigan	Michigan	**Toronto (3rd)**	Columbia	**Toronto (3rd)**
4	Columbia	Columbia	Columbia	**Toronto (4th)**	Columbia
5	New York	New York	Michigan	Michigan	Michigan
6	**Toronto (6th)**	**Toronto (6th)**			

Top 5 Canadian Universities in the ARL Ranking of Major North American Research Libraries				
2015-2016	**2016-2017**	**2017- 2018**	**2018- 2019**	**2019-2020**
RANK/UNIVERSITY	**RANK/UNIVERSITY**	**RANK/UNIVERSITY**	**RANK/UNIVERSITY**	**RANK/UNIVERSITY**
6/Toronto	**6/Toronto**	**3/Toronto**	**4/Toronto**	**3/Toronto**
31/Alberta	29/Alberta	29/Alberta	30/Alberta	39/Alberta
35/British Columbia	37/British Columbia	33/British Columbia	40/British Columbia	40/British Columbia
42/McGill	40/McGill	38/McGill	47/McGill	51/McGill
63/Calgary	75/Calgary	69/Manitoba	62/Ottawa	75/Calgary

Space and Access Services: The UTL's 40 libraries are divided into four administrative groups: Central, Departmental/local, Campus (UTM & UTSC) and Federated and Affiliated College Libraries. The UTL provides a variety of individual and group study spaces for students. Study space and computer facilities are normally available twenty-four hours, five days per week at one location, Robarts Library, with additional extended hours during study and exam periods at both UTSC and UTM. Web-based services and electronic materials are accessible at all times from campus or remote locations.

Teaching, Learning & Research Support: Libraries play an important role in the linking of teaching and research in the University. To this end, information literacy instruction is offered to assist in meeting Civil and Mineral Engineering degree level expectations in the ability to gather, evaluate and interpret information. Librarians

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[1] As per Association of Research Libraries Statistics.

[2] Figures as of January 2021

collaborate with instructors on assignment design, provide student research consultations, and offer just-in-time student research help in person, by phone, or through online chat. Librarians are also available to support curriculum mapping initiatives. Special initiatives, such as the Libraries Undergraduate Research Prize, and an annual forum for student journal editors, extend information literacy beyond the classroom. These services align with the Association of College and Research Libraries (ACRL) *Framework for Information Literacy for Higher Education*.[3]

Program Specific Instructional Support: Instruction occurs at a variety of levels for Civil and Mineral Engineering students and is provided by the faculty liaison librarian for the Department of Civil & Mineral Engineering. The Engineering & Computer Science Library facilitates formal instruction integrated into the class schedule and hands-on tutorials related to course assignments, for example *MIN250 Surface Mining*, and *CIV220 Metabolism of Cities*. The Library, through its liaison librarians, customizes feeds of library resources which appear prominently in Quercus course pages (e.g., https://guides.library.utoronto.ca/MIN250). The liaison librarian for Civil and Mineral Engineering also regularly provides information literacy instruction workshops for graduate students in specific research groups in the department, for example, the Transportation Research Group (https://guides.library.utoronto.ca/transportation).

Collections: Many college and campus libraries collect materials in support of Civil and Mineral Engineering; the largest collection of materials is centrally located in the Engineering & Computer Science Library. Collections are purchased in all formats to meet the variety of preferences and styles of our current students and faculty. The University of Toronto Library is committed to collecting both print and electronic materials in support of civil and mineral engineering at the University of Toronto.

Journals: The Library subscribes to 24 of the top 25 journals listed in Journal Citation Reports (JCR)[4] in subject area "engineering, civil", and 19 of the 21 journals listed in JCR in the subject area "mining and mineral processing". Of these titles, all 24 of the Civil Engineering journals and 19 of the mining journals are available electronically to staff and students of the University. We prioritize acquisition of online journals where possible.

Monographs: The UTL maintains comprehensive book approval plans with 50 book vendors worldwide. These plans ensure that the Library receives academic monographs from publishers all over the world in an efficient manner. In support of Civil and Mineral Engineering, monographs are purchased in electronic form where possible, and the Library currently receives all current e-books directly from the following publishers: Springer, Elsevier, IEEE, Taylor & Francis, and Wiley.

Preservation, Digitization, and Open Access: The UTL supports open access to scholarly communication and research information through its institutional research repository (known as T-Space), its Downsview print repository, its open journal services, subscriptions to open access publications, and support for preservation of research materials in all formats. In addition to acquiring materials in support of civil and mineral engineering, the Library has digitized its monograph holdings published before 1923. These books are available without charge to any Internet user. Faculty of Applied Science and Engineering researchers actively archive their publications in TSpace and the Department of Civil & Mineral Engineering has its own subcommunity. The

[3] Association of College & Research Libraries. Framework for Information Literacy for Higher Education. ACRL, 2016. http://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/infolit/Framework_ILHE.pdf

[4] 2020 Journal Citation Reports® (Thomson Reuters, 2022)

Engineering & Computer Science Library assists Civil and Mineral Engineering researchers with depositing their papers into TSpace.

Key Databases: Compendex; ASCE Civil Engineering Database; GEOBASE

Special Collection Highlight: The Library subscribes to several standards collections online, including ASHRAE, ACI, CSA, ISO, IEEE, and ASTM, standards.

Current Gaps: We are no longer able to subscribe to *Mining Magazine*, an important publication for mineral engineers because the publisher does not provide access according to the Library's technical requirements.

Other Library-departmental engagement: In 2017/2018, engineering librarians conducted a research study that involved interviewing 15 civil engineering faculty about their research practices. The study resulted in a deeper understanding of how the library can support research endeavours and closer connections with many of the faculty members that participated.

Prepared by: Angela Henshilwood, Title: Head, Engineering & Computer Science Library, Date: January 21, 2022

Submitted by: Larry Alford, Chief Librarian, University of Toronto Libraries, Date

University of Toronto Student Services Statement (St. George Campus)

Student Services Statement [St. George Campus]

All University of Toronto undergraduate and graduate students have access to student services on all three campuses, Mississauga, St. George (downtown Toronto), and Scarborough, regardless of their 'home campus'. The services and co-curricular educational opportunities provide a complement to the formal curriculum by engaging and challenging students to reach their full potential as learners, leaders and citizens. At the University of Toronto (St. George Campus) these services are organized by Student Life, the academic division registrar and local student life offices, and the School of Graduate Studies. All these services combine to support the success of our students from the time they are admitted through degree completion and beyond.

Students have access to comprehensive **physical and mental health care** on campus, including a medical clinic, travel medicine services, immunization, contraception and sexual health education. Counselling and treatment options for psychological and emotional concerns include psychotherapy, group therapy and pharmacotherapy, as well as specialized assault counselling services provided both by the Health and Wellness Centre and the Sexual Violence Prevention and Support Centre. In addition, a large number of wellness programs are provided, such as mindful meditation, workshops on coping skills and stress management. All students on all campuses have access to UofT MySPP, a multilingual immediate and/or ongoing confidential, 24-hour counseling support for any school, health or general life concern at no cost to students.

Housing needs, including residence application assistance, off-campus housing listings, and resources for students on the rental housing search, tenant rights and responsibilities, as well as assistance with finding temporary/urgent overnight accommodation, are met through the Housing Services.

Coaching and education in the development of key **learning skills** — from time management to reducing exam anxiety — is provided through **Academic Success**. Academic Success also partners with faculty to integrate success strategies and support into the curriculum. Students can explore what to do with their degree, discover job opportunities and further education by accessing programs, services and resources designed and delivered by **Career Exploration & Education**. Through workshops, appointments, events and job shadowing opportunities students can identify goals, navigate career decisions, build job searching skills

Revised: April 2022

and develop meaningful connections with employers and alumni. Career Exploration & Education also works with faculty and instructors to integrate career learning into their courses and curriculum.

International learning opportunities (study, research and professional experiences outside of Canada) for all students on all campuses enable the development of global fluency in academic, personal and career spheres. Opportunities are catalogued at learningabroad.utoronto.ca. Student **Safety Abroad** support is provided to all students on all university activity abroad. Opportunities for the development of global fluencies and skills are available to all students through on campus international learning co-curricular and experiential learning.

Specialized services are provided for **international students** including but not limited to pre-arrival, transition to Toronto, study and work permit advising, health insurance for international students and their dependents who are residents of Ontario, impact of lived experience and previous academic culture on teaching and learning expectations and peer resources for life as a U of T student. Specialized services are also available for all students whose health or disability impacts their functioning (academic accommodations, systems navigation, referrals, resources, skill development, peer programming and support) students with **children or other family responsibilities** (advising, resources, subsidized child care), **Indigenous students** (culturally relevant academic support, financial counselling) and **lesbian, gay, bisexual and transgender** students (counselling, referrals, equity outreach and engagement).

Participation in **campus life** and **experiential learning** are facilitated through Hart House (clubs, committees, events), the Centre for Community Partnerships (community-engaged learning and research opportunities , the Multifaith Centre (engage with religious diversity including spiritual and non-religious perspectives, interfaith programs, meditation and yoga, providing space for prayer, cultural and spiritual practices), and Clubs and Leadership Development (leadership development, equity education, recognition and support for student groups, activities, office, meeting and activity space for clubs). **Sport and recreational facilities and programs** are provided to all students through both Hart House and the Faculty of Kinesiology and Physical Education. **Campus involvement** is supported actively through Orientation, Transition and Engagement (co-curricular record).

Support for the transition into life as a student are facilitated through Orientation, Transition and Engagement (transition programs, orientation coordination and support, outreach,

Revised: April 2022

parent and supporter resources) as well as **Mentorship and Peer Programs** (events for equity-seeking communities, 1:1 peer support, workshops). Programs and services designed to support Black, Latin American, Southeast Asian and First Generation students are offered through Mentorship and Peer programs.

Gradlife is a comprehensive suite of programs, services and initiatives offered across the Division of Student Life that are developed with a graduate student audience in mind. Gradlife includes skills development, social, academic and community building activities to support a holistic graduate student experience.

[Divisions may wish to augment this with:
- registrarial services; academic advising
- writing centres
- program-related career services
- student activity spaces
- residence life programs and services
- student life programs (orientation; first-year learning communities, etc.)]

School of Graduate Studies Student Services [all campuses]

In addition to the above services available to all students, graduate students have access to registrarial services and co-curricular programs at the School of Graduate Studies (SGS) that assist students in meeting their academic goals.

Administrative staff at SGS provide **registrarial services** to graduate students including but not limited to recruitment, admission, orientation, registration, fees, program progress, awards/financial assistance and graduation. Fully equipped meeting rooms, which can be booked by student groups when not used for Final Oral Examinations, are distributed across two locations, the newly renovated 63 St. George Street (home of SGS Student Services) and 65 St. George Street. Financial advising, health & wellness and accessibility counselling services are also available at 63 St. George.

Two multi-purpose spaces, provided by SGS, are dedicated to graduate students. **Grad Room** is an accessible space on the St. George campus which provides University of Toronto graduate students with a lounge area and a space for academic, social and graduate professional skills programming. An additional lounge area for graduate students is available at 63 St. George, which provides graduate students with a quiet place to read, relax or study.

Grad Room is also home to the **Graduate Professional Skills Program** (GPS). GPS is a non-academic program presented by SGS consisting of a variety of offerings that provide doctoral stream students a range of opportunities for professional skills development. The program focuses on skills beyond those conventionally learned within a disciplinary program, skills that may be critical to success in the wide range of careers that graduates enter, both within and outside academe. GPS aims to help students communicate effectively, plan and manage their time, be entrepreneurial, understand and apply ethical practices, and work effectively in teams and as leaders.

The **Centre for Graduate Mentorship & Supervision (CGMS)** offers support to all members of the University of Toronto graduate community to help them achieve and maintain successful mentorship and supervisory relationships. Graduate students, supervisors, graduate chairs, and anyone else involved in the mentorship and supervisory relationship can contact CGMS about an issue or an incident and have a confidential conversation with trained staff. CGMS is dedicated to building capacity through consultation and skill development for both graduate students and supervisors, system navigation and collaboration with other University partners, and identifying and developing resources that are aligned with best practices in graduate mentorship and supervision.

The **Graduate Centre for Academic Communication** (GCAC) provides graduate students with advanced training in academic writing and speaking. By emphasizing professional development rather than remediation, GCAC helps students to become familiar with the new genres they encounter in graduate school – such as literature reviews, research grants, research articles, and dissertations – and to cultivate a range of strategies for communicating expertise effectively in both writing and speech. GCAC offers five types of instruction designed to target the needs of both native and non-native speakers of English: non-credit courses, single-session workshops, individual writing consultations, guest talks given by invitation within graduate courses, and writing boot camps.

Documents provided under separate cover:

FASE Supplemental Documentation

Faculty of Applied Science & Engineering: By the Numbers 2022

Additional Resources

Department of Civil & Mineral Engineering Strategic Plan 2023-28
Civil & Mineral Engineering Self-Study 2017

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