

Chemical Engineering and Applied Chemistry, PhD

Faculty of Applied Science and Engineering

grad**OUTLINE**

FUTURE STUDENTS

Admissions to U of T

For full details, please review the online admissions instructions.

Link: chem-eng.utoronto.ca/graduate-studies/applications-and-admissions/masc-and-phd-applications/

QUESTIONS?

Contact:

Graduate Administrator

Telephone:

416-978-7137

Email:

grad.chemeng@utoronto.ca

Department Website:

www.chem-eng.utoronto.ca

* This resource offers guidance and will not reflect everyone's experience of the program.

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ABOUT THIS PROGRAM

Chemical Engineering and Applied Chemistry impacts much of our modern world. We seek to integrate chemistry, biology and engineering to impact global challenges in energy, the environment and health. Research with us will give you the opportunity to partner with world leaders to bridge science and real-world challenges, to develop the analytical and leadership tools required to succeed in today's workplace, and to build your network of colleagues and mentors.

FIRST YEAR

YOUR DEGREE TIMELINE

CHE 2222H
(before starting in lab)

JDE 1000H
CHE 300xH (both terms)
CHE 1102H
1-4 academic courses

Qualifying Exam
(in the first 9-13 months)

MIDDLE YEARS

Achieve PhD Candidacy by:

- » Completing CHE 300xH (both terms each year)
- » Completing all academic courses
- » Holding supervisory committee meetings every 8-12 months

FINAL YEAR/TRANSITION

CHE 300xH (both terms)
Write final thesis

Complete departmental oral defence

Complete SGS Final Oral Exam (your final defence)

STRATEGIES FOR SUCCESS

PLAN

MAXIMIZE YOUR RESEARCH IMPACT

- Identify a research question that meets a gap in the field (read lots!).
- Formulate your research objectives.
- Learn how to design, conduct, optimize and troubleshoot a controlled experiment.
- Learn how to best communicate with your supervisor/team to support your needs.

REFLECT

- How does my proposed research approach differ from what has been done before and why is it more likely to be successful?
- How generalizable is my research question and solution?

BUILD YOUR PROFESSIONAL SKILLS

- Complete CHE 1102H — Research Methods & Project Execution.
- Make a plan for achieving your professional development goals and why each thing you do will help you achieve these goals (get advice from upper-year students).
- Create a system to manage your time.
- Learn how to network — it's a new skill for some and it takes practice.

REFLECT

- What are my professional skill strengths and weaknesses?
- What can I do to address gaps in my professional skills?

BUILD YOUR NETWORK, BROADEN YOUR OUTLOOK

- Create LinkedIn and Engineering Connect profiles and get feedback on them.
- Create an email footer.
- Conduct an informational interview with someone working in a field of interest.
- Attend orientation events/classes to meet peers in your group, department and Faculty.
- Volunteer for a student association within the community.

REFLECT

- How do I currently network and what other methods could I employ?
- What potential careers outside academia might be interesting?
- What kind of people do I need to help me solve big problems?
- How do the skills of others complement my own?

MASTER

- Master core technical methods required for your project experiments.
- Transition from collecting preliminary data to creating publication-quality data.
- Establish a peer network to gain feedback on your research (not just in your own lab!).
- Refine your research question and don't be afraid to walk away from a bad idea.
- Develop the critical thinking skills to assess your own and others' research.
- Co-author a paper to understand the publishing process.
- Present your research orally to master research storytelling.

REFLECT

- How can I refine my plan into manageable chunks that still have broad implications?
- How can I design my experiments for the best chance of success?
- How confident am I in my data and what does it mean?

- Intentionally develop professional skills to achieve goals set in Year 1.
- Identify opportunities to build your confidence and understand your values.
- Take leadership, communication, entrepreneurship, or cross-disciplinary courses.
- Take on leadership roles in professional societies (e.g. volunteer at a conference).
- Request to attend/present at meetings with industry partners or collaborators.
- Mentor an undergraduate research student.

REFLECT

- How far have I come in my professional development?
- How do my professional skills and activities align with my personality traits?
- What experiences have enabled me to effectively develop my skills and confidence?

- Attend at least one event with an opportunity to network each week (this doesn't have to be formal — you can meet people anywhere!).
- Conduct regular informational interviews with new people in various fields.
- Attend conferences and follow up with new connections.
- Identify opportunities for meaningful involvement that will have impact.
- Request introductions to expand your network.

REFLECT

- How can I build meaningful connections with people?
- What are the characteristics of an excellent collaborator, mentor, champion?
- What do I want to learn when I network?
- How can I use my network to help others?

ACHIEVE

- Aim to publish in the best journal possible (don't be scared to try).
- Present at international conferences that give you exposure to the audience you want.
- Select an external examiner who will potentially increase the impact of your work.
- Understand what research question is next.

REFLECT

- How can I best communicate the key ideas behind my findings?
- How can my findings be taken to the next level (practice, commercialization, etc.)?

- Establish examples of impact to highlight your professional skills.
- Provide leadership within your group, department and professional community.

REFLECT

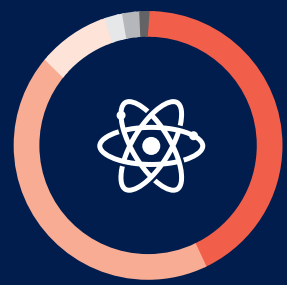
- How can I exploit my professional skills to further my research impact and career?
- How can I use my professional knowledge to mentor others?

- Listen for job opportunities in your network.
- Facilitate connections between new students and your established network.

REFLECT

- How can I leverage my network to transition?
- How can I network with people who are at an earlier career stage than me?
- How will I continue to network when I am no longer a student?

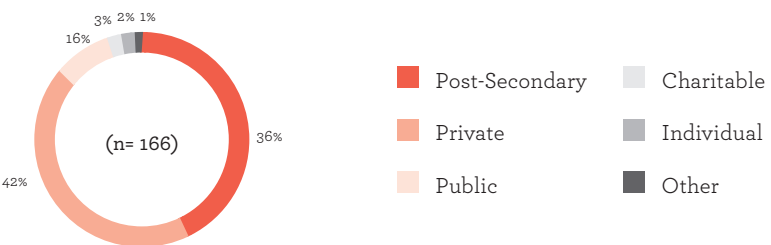
How to use this resource: Read the chart both by row and by column. You'll discover opportunities to enhance your experience of graduate school and ease your transition into a rewarding career.*



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10K PhDs — Departmental Career Outcomes Data Employment Sector Breakdown



Private Sector Breakdown



Top Employers by Sector



Post-Secondary Sector

- University of Toronto
- Western University
- Massachusetts Institute of Technology



Private Sector

- BASF
- Hatch
- TD Canada Trust



Public Sector

- Environment and Climate Change Canada
- Ministry of the Environment and Climate Change
- Ontario Centres of Excellence

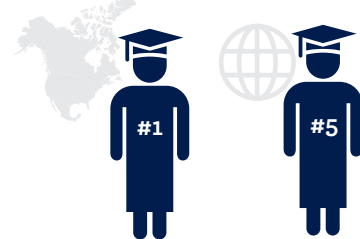
Where in the world do Chemical Engineering PhDs work?

63% Employed in Canada

36% Employed Outside of Canada



2017 Global Employability Rankings for Public Universities



U of T is ranked 1st in North America

U of T is ranked 5th in the World

“ I found the support during my PhD really was unparalleled, both in terms of my colleagues but as well as the institutional resources available. I was able to network with other industry leaders who eventually joined the board of the biotechnology company I co-founded with the help of the University from work I did during my PhD. ”

— Vik Pandit, PhD 2017

PHYSICAL SCIENCES PhDs AND THE 10,000 PhDs PROJECT

COMMONLY ASKED QUESTIONS

Q: Should I pursue a postdoctoral fellowship?

A: In the most recent cohorts of Physical Sciences PhDs (2012-2015), 24% of found graduates chose to pursue a postdoctoral fellowship.

Postdoctoral fellowships serve a very specific and critical function in preparing for a career in academia (the National Postdoctoral Association is an excellent resource: nationalpostdoc.org).

However, some recent research indicates that different work experiences might be more advantageous for those considering a non-academic career path.¹ PhD graduates interested in careers in industry may find greater benefits from internships or going directly into entry-level positions that enable PhD graduates to explore a broader range of job options and determine a position's "fit" before focusing on that career path. They may also offer higher salaries than postdoctoral fellowships.

Q: Where are Physical Sciences PhDs employed?

A: As of 2016, the Post-Secondary Education (49%) and Private (40%) Sectors welcomed the majority of Physical Sciences PhDs. Of the graduates who found employment in PSE, 53% held tenure or tenure-stream positions. Top employment fields in the Private Sector included Banking/Finance/Investment, Pharmaceuticals, Computing Technology, R&D, Information Technology/Internet/Social Media, and Manufacturing.

“ If in the future an academic position is on my path, my industry experience will be a great asset I will be able to share with students. ”

— Silvia Zarate, PhD 2016

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IDENTIFY YOUR TRANSFERABLE SKILLS

With a PhD in Chemical Engineering, you will take these valuable skills into the workforce:

- Advanced critical thinking and analysis
- Quantitative decision-making
- Experimental design
- Collaborative problem-solving
- Project definition and prioritization
- Strategic planning
- Project management and execution
- Communication & interpersonal relationship-building
- Mentoring, leadership and team-building

BOOST YOUR CAREER POTENTIAL

- Connect with upper-year graduate students to learn how they started their job search.
- Recognize and build upon your transferable skills. Register for GPS courses/workshops at uoft.me/GPS.
- Share your CV with your supervisor and peers to gather constructive feedback.
- Create a LinkedIn profile and get feedback from mentors and peers.
- Request informational interviews with alumni and/or professionals in a variety of job settings.
- Explore salary ranges and career trajectories from databases such as payscale.com or salary.com.

BUILD YOUR PROFESSIONAL SKILLS AND CAREER

- Graduate Centre for Academic Communication (GCAC) uoft.me/GCAC
- Graduate Professional Skills Program (GPS) uoft.me/GPS
- Career Exploration & Education studentlife.utoronto.ca/cc/grad-students
- Alumni Mentorship Program alumni.engineering.utoronto.ca/future-alumni/alumni-mentorship-program
- Graduate Engineering Career Fair gradstudies.engineering.utoronto.ca/graduate-engineering-career-fair
- Professional Engineers Ontario peo.on.ca/index.php
- Insight Data Science Fellows Program insightdatascience.com
- Troost Institute for Leadership Education in Engineering ilead.engineering.utoronto.ca
- U of T Engineering Connect uoftengineeringconnect.ca
- PPIT gradstudies.engineering.utoronto.ca/research-degrees/prospective-professors-in-training
- Skule™ Alumni Outreach alumni.skule.ca

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TIPS FOR CONDUCTING AN INFORMATIONAL INTERVIEW

Sample questions:

- What career path did you take to get to this position?
- What are the most important skills you use in your work? How did you develop these?
- What do you wish you had learned that would be useful in your position today?
- What possibilities are there for advancing in this company/field/industry?
- How is your work-life balance?

On the day...

Follow up your meeting with a thank-you email. Include a LinkedIn invitation and ask any further questions.

SAFETY AT U OF T

- Campus Police (24/7, St. George):** 416-978-2222
- Gerstein Centre Crisis Line (24/7):** 416-929-5200
- Good2Talk Hotline (24/7):** 1-866-925-5454
- U of T Sexual Violence Prevention & Support Centre:** 416-978-2266

Website: www.safety.utoronto.ca

10K PHDS PROJECT

The 10,000 PhDs Project, an initiative of the School of Graduate Studies at the University of Toronto, used Internet searches of open-access data sources such as official university and company websites to determine the current and/or first (2016) employment status of the 10,886 PhDs who graduated from U of T between 2000 and 2015 in all disciplines. The study successfully located 88% of PhD graduates.

“ I learned how to learn quickly and effectively while doing my PhD which is a critical skill when making investments in startups as a venture capitalist. ”

— Angela Tran Kingyens, PhD 2012

¹ See Melanie V. Sinche, *Next Gen PhD: A Guide to Career Paths in Science* (Cambridge, MA: Harvard University Press, 2016).