



# 2022 Canadian Engineers for Tomorrow

Trends in Engineering Enrolment and Degrees Awarded 2022

# **Trends in engineering enrolment and degrees** awarded 2017-2022

## Message from the Chief Executive Officer



Engineers Canada is pleased to publish the 2023 edition of *Canadian Engineers for Tomorrow*, highlighting trends related to enrolment and degrees awarded in post-secondary engineering education in Canada. This document comprises information on all academic terms from the calendar years 2017 through 2022.

Canadian post-secondary institutions continue to report a strong growth in undergraduate degrees awarded, presenting 8.7 per cent more engineering degrees in 2022 than in 2017. It is once again positive to see that most engineering disciplines awarded more degrees in 2022 than in 2017, and that many engineering disciplines have experienced a growth in undergraduate enrolment numbers in the same period.

We are excited to report that the proportion of self-identified female students enrolled in undergraduate and postgraduate programs, as well as the proportion receiving undergraduate degrees, has reached an all-time high. As of 2022, self-identified females comprised 25.2 per cent of undergraduate students, 28.0 per cent of postgraduate students, and 23.3 per cent of undergraduate engineering degrees awarded. As the profession moves toward Engineers Canada's 30 by 30 goal – where 30 per cent of newly licensed engineers are women by 2030 – this increasing representation at the undergraduate level is an important indicator of progress.

Meanwhile, Canadian engineering programs remain a popular choice for international students. In 2022, the number of international undergraduate students reached 15,365, or 18.1 per cent of total undergraduate engineering enrolment.

For the sixth consecutive year, Engineers Canada collected data regarding Indigenous students' enrolment and degrees awarded. Indigenous people are still greatly underrepresented in engineering education, accounting for only 0.6 per cent of reported undergraduate students. This is around eight times lower than the 4.9 per cent of people in Canada who identify as Indigenous (Statistics Canada, 2017).

Engineers Canada will continue to track this information in the coming years to identify trends and to further encourage enrolment and achievement by post-secondary engineering programs that reflect Canada's diversity.

#### **Acknowledgements**

In preparing this report, Engineers Canada gratefully acknowledges the contribution of data and information from the deans and associate deans of the engineering and applied science faculties at Canadian higher education institutions.

# Introduction

*Canadian Engineers for Tomorrow* is an annual examination of Canada's undergraduate and postgraduate engineering programs. It evaluates trends in part- and full-time student enrolment and degrees awarded over a five-year period. In 2023, 46 higher education institutions provided information on their enrolment, programs, and degrees awarded.

The results highlight enrolment trends by discipline and institution, as well as the number of undergraduate and postgraduate degrees awarded each year. These results reveal trends specific to discipline, education level, gender, and international students' participation in Canadian engineering education as well as the number of engineering graduates available to enter the labour market. Enrolment trends at the undergraduate, master's, and doctoral levels are compared, along with self-identified male and female students studying and graduating from engineering programs. For the sixth consecutive year, data regarding Indigenous peoples' enrolment and graduation from engineering programs is presented in this report. Engineers Canada plans to continue collecting this data in coming years to be able to identify emerging trends.

Data is provided by higher education institutions to Engineers Canada and compiled for this report. Findings are then shared with stakeholders in engineering across Canada and the public in the form of this report. Engineers Canada greatly appreciates the contribution of the higher education institutions to this work.

## Notes to the reader

- »When comparing data between years, only those higher education institutions who consistently responded to the survey year-after-year are included in the comparison. If an institution did not provide data in one or more of those years, they were not included in the comparison. This is done to ensure that the comparisons are fair and as accurate as possible. Small inaccuracies in the reported data, as well as changes in programming, will affect the percentages presented throughout the report.
- »Four program types were re-classified from engineering physics to the "other" category, affecting a total of six engineering programs. Though it may appear that there is an increase in the percentage of enrolment and degrees awarded, this is only a consequence of the reclassification and does not reflect any actual increases in those programs that are part of the other category.
- »Sex identifiers have been limited to 'male', 'female', 'non-binary', and 'prefer not to specify'". We use 'female-identified' to describe individuals who self-identified as female and 'male-identifying' to describe individuals who self-identified as male, to limit the conflation of sex and gender and acknowledge the gender diversity that exists within these sex identities.

# **Undergraduate students**

# Total undergraduate student enrolment

Undergraduate student enrolment in accredited engineering programs totalled 85,113 in 2022. This is an increase of 3.0 per cent from 2017 and a 6.0 per cent decrease from 2020.



## Total undergraduate student enrolment by discipline

The undergraduate engineering disciplines with the highest enrolment in 2022 were mechanical engineering, civil engineering, and electrical engineering. These represent 20.5 per cent, 12.1 per cent, and 10.4 per cent of total undergraduate enrolment, respectively. Conversely, the fields that accounted for the smallest proportion of undergraduate enrolment were materials or metallurgical engineering (1.9 per cent), mining or mineral engineering (1.0 per cent), and geological engineering (0.9 per cent).

Materials or metallurgical (72.4 per cent), software (54.0 per cent), and geological (31.6 per cent) demonstrated the highest growth since the previous year. Similarly, the disciplines that experienced the largest cumulative growth from 2017 were materials or metallurgical (85.3 per cent), software engineering (54.0 per cent), and other (49.9 per cent). Conversely, environmental (-27.5 per cent), electrical (-16.9 per cent), and chemical engineering (-13.6 per cent) had the largest decline from the previous year.

Seven disciplines experienced a decline in enrolment since 2017: engineering physics (-43.6 per cent), mining or mineral engineering (-16.3 per cent), electrical engineering (-21.1 per cent), environmental (-16.0 per cent), chemical engineering (-12.0 per cent), and civil engineering (-13.7 per cent). Once again, these comparisons were made between institutions that consecutively replied to the enrolment and degrees awarded survey since 2017.



Chart 1.2 - Undergraduate enrolment by program (2017-2022, full-time equivalent)

## Total undergraduate student enrolment by province

The highest proportion of undergraduate enrolment continues to be in Ontario and Quebec. In 2022, these provinces accounted for 41.7 per cent and 26.6 per cent of total enrolment, respectively. Furthermore, British Columbia (12.4 per cent) and Quebec (3.7 per cent) underwent the largest percentage increase in enrolment from the previous year.

The highest cumulative enrolment growth from 2017 occurred in British Columbia (28.9 per cent) and Alberta (11.4 per cent).

Saskatchewan (-20.9 per cent), Nova Scotia (-17.8 per cent), New Brunswick (-14.7 per cent), Ontario (-13.6 per cent), Newfoundland and Labrador (-7.6 per cent), Alberta (-3.5 per cent) and Manitoba (-0.8%) were the only provinces to experience a decrease from the previous year. Nova Scotia (-24.3 per cent), Saskatchewan (-20.1 per cent), Newfoundland and Labrador (-6.5%), New Brunswick (-4.1) and Ontario (-2.7 per cent) were the only provinces to experience a decrease in enrolment since 2017. Once again, these comparisons were made between institutions that consecutively replied to the enrolment and degrees awarded survey since 2017.



Chart 1.3 - Average growth in undergraduate enrolment by province (2017-2022, 2020-2022, full-time equivalent)

#### Total undergraduate degrees awarded

The number of undergraduate degrees awarded totalled 17,151 in 2022, which is a decrease of 5.7 per cent from the previous year. This is a noteworthy decrease when compared to the average annual increase of 5.1 per cent for the period of 2017 to 2022. Cumulatively, the number of degrees awarded across Canada has increased 8.7 per cent from 2017. Once again, these comparisons were made between institutions that consecutively replied to the enrolment and degrees awarded survey since 2017.



Chart 1.4 - Undergraduate degrees awarded (2017-2022)

Chart 1.5 shows that Prince Edward Island, and Alberta had the highest increases in undergraduate degrees awarded from 2020, growing 34.5 per cent and 1.5 per cent, respectively. Similarly, Prince Edward Island,

Nova Scotia, British Columbia, Quebec and Ontario experienced the highest increases in undergraduate degrees awarded from 2017, with growth of 457.5 per cent, 22.3 per cent, 16.5 per cent, 13.2 per cent and 9.0 per cent, respectively.

New Brunswick (-26.5 per cent), Saskatchewan (-23.6 per cent), Manitoba (-8.3 per cent), Ontario (-8.3 per cent), Newfoundland and Labrador (-4.7 per cent) and Nova Scotia (-3.4 per cent) experienced decreases in undergraduate degrees awarded from the previous year. No provinces experienced a decrease in undergraduate degrees awarded from 2017. Once again, these comparisons were made between institutions that consecutively replied to the enrolment and degrees awarded survey since 2017.



# Chart 1.5 - Average growth in undergraduate degrees awarded by province (2020-2022, 2017-2022)

Mechanical engineering, civil engineering, and electrical engineering awarded the greatest number of degrees in 2022, representing 25.3 per cent, 15.3 per cent, and 13.1 per cent of the total, respectively. Furthermore, software engineering exhibited the largest growth in degrees awarded from 2020 (11.3 per cent) and computer engineering exhibited the largest growth in degrees awarded from 2017 (118.0 per cent).

Engineering physics (-53.1 per cent), mining or mineral engineering (-50.0 per cent), materials or metallurgical engineering (-31.4 per cent), geological engineering (-16.9 per cent), chemical (-14.7 per cent), electrical (-12.8 per cent) and civil (-7.6 per cent) were the only disciplines to experience decreases since 2017 in the number of undergraduate degrees awarded. materials or metallurgical engineering (-36.0 per cent), environmental (-26.0 per cent), electrical engineering (-12.7 per cent), civil (-10.7 per cent), chemical engineering (-10.4 per cent), civil engineering (-10.7 per cent), and mechanical engineering (-5.9 per cent) have seen decreases since 2020.



Chart 1.6 - Average growth in undergraduate degrees awarded by discipline (2020-2022, 2017-2022)

# **Postgraduate students**

# Total postgraduate student enrolment

Postgraduate student enrolment totalled 30,271 in 2022. When comparing institutions that consecutively replied to this survey since 2017, graduate student enrolment increased by 2.1 per cent from 2020 and 26.2 per cent from 2017, averaging a 5 per cent annual growth rate.



#### Chart 1.7 - Postgraduate student enrolment (2017-2022, full-time equivalent)

The province that experienced the highest growth in postgraduate enrolment over the previous year was Prince Edward Island (27.8 per cent). The province that displayed the highest cumulative growth since 2017 was New Brunswick (86.0 per cent). The provinces to experience a decrease from 2020 were New Brunswick (-25.4 per cent), Quebec (-15.1 per cent), Saskatchewan (-5.6 per cent), Manitoba (-4.9 per cent), and Newfoundland and Labrador (-3.9 per cent). Compared to 2017, there has been no decrease in postgraduate enrolment. Once again, these comparisons were made between institutions that consistently reported to the enrolment and degrees awarded survey since 2017.



Chart 1.8 - Average rate of change in postgraduate student enrolment by province (2020-2022, 2017-2022, full-time equivalent)

## Total postgraduate degrees awarded

A total of 10,071 master's and 1,652 doctoral of engineering degrees were awarded in 2022, for a combined total of 11,723 postgraduate degrees. This corresponds to a growth of 5.7 per cent in master's degrees awarded and an increase of 4.7 per cent in doctoral degrees awarded from 2020. There has been a cumulative growth of 53.5 per cent in master's degrees awarded and 5.7 per cent in doctoral degrees awarded since 2017.



#### Chart 1.9 - Postgraduate degrees awarded (2017-2022)

Newfoundland and Labrador had the largest growth in the number of master's degrees awarded in 2020 (265.7 per cent) and Newfoundland and Labrador had the largest growth since 2017 (1477.1 per cent).

Chart 1.10 indicates the average growth in master's degrees awarded by province for the periods of 2017 to 2022 and 2020 to 2022, while Chart 1.11 indicates the same data for doctoral degrees. Once again, these comparisons were made between institutions that consecutively replied to the enrolment and degrees awarded survey since 2017.









# **Female-identified students**

# Female-identified undergraduate enrolment

Female-identified undergraduate enrolment remained above 20 per cent in 2022, with a 1.0 per cent increase from 24.2 per cent in 2020 to 25.2 per cent in 2022. The total number of self-identified females enrolled in undergraduate-level engineering programs has decreased by 1.9 per cent since 2020 and 19.2 per cent since 2017.



#### Chart 2.1 - Female-identified undergraduate enrolment (1991-2022, full-time equivalent)

#### Female-identified undergraduate enrolment by discipline

The disciplines that experienced the highest proportion of female-identified undergraduate enrolment in 2022 were biosystems engineering (54.5 per cent), chemical engineering (43.9 per cent), and environmental engineering (39.3 per cent).

The disciplines with the lowest percentages of female-identified undergraduate enrolment were mining or mineral engineering (17.3 per cent), mechanical engineering (17.5 per cent), computer engineering (18.6 per cent), and software engineering (19.0 per cent). While these four disciplines account for 40.2 per cent of the total number of undergraduate students, they only account for 28.0 per cent of the total number of female-identified undergraduate students.

Furthermore, the disciplines that experienced the highest growth in the proportion of female-identified students from 2019 were engineering physics, material and metallurgical engineering and geological engineering which rose 40.6 per cent, 38.5 per cent, and 22.6 per cent respectively.

Similarly, the disciplines that experienced the highest growth in the proportion of female-identified students from 2017 were software engineering, biosystems engineering, and computer engineering, which rose 99.8 per cent, 68.8 per cent and 67.9 per cent, respectively.



Chart 2.2 - Female-identified undergraduate enrolment by discipline (2022, full-time equivalent)



Chart 2.3 - Average growth in female-identified undergraduate enrolment by discipline (2020-2022, 2017-2022, full-time equivalent)

## Female-identified undergraduate enrolment by province

Ontario had the highest percentage of female-identified undergraduate students (27.6 per cent), while Saskatchewan had the lowest (19.3 per cent). As shown in Chart 2.5, three provinces experienced increases in female-identified undergraduate enrolment since 2020, while six provinces experienced increases since 2017. Once again, these comparisons were made between institutions that consecutively replied to the enrolment and degrees awarded survey since 2017.



Chart 2.4 - Female-identified undergraduate student enrolment by province (2022, full-time equivalent)



Chart 2.5 - Average growth in female-identified undergraduate student enrolment by province (2020-2022, 2017-2022, full-time equivalent)

## Undergraduate degrees awarded to female-identified students

Of the 17,151 engineering degrees awarded in 2022, 3,999 were awarded to female-identified students, accounting for 23.3 per cent of the graduates. When comparing engineering programs that consecutively replied to this survey, decrease of 3.6 per cent from 2020 and 30.2 per cent from 2017 were observed.



Chart 2.6 - Undergraduate degrees awarded to female-identified students (2017-2022)

The provinces with the highest proportion of undergraduate degrees awarded to female-identified students are Newfoundland and Labrador (26.7 per cent), followed by Ontario (24.4 per cent), and New Brunswick (24.2 per cent). Additionally, British Columbia had the greatest increase in the proportion of undergraduate degrees awarded to female-identified graduates when compared to 2020 with a growth of 24.3 percentage points overall.



#### Chart 2.7 - Undergraduate degrees awarded to female-identified students by province (2022)

The disciplines that had the highest growth over the previous year in the proportion of undergraduate degrees awarded to female-identified graduates were that of software engineering (14.2 percentage points increase) and engineering physics (9.3 percentage points increase). The categories that experienced the highest growth from 2017 were those of biosystems engineering (9.1 percentage points increase) and computer engineering (8.7 percentage point increase).

If it is assumed that the proportion of female-identified students granted degrees matches pace with the number of female-identified students enrolled, the proportion of undergraduate degrees awarded to female-identified graduates will likely experience growth in the coming years due to the increase in the proportion of female-identified undergraduate enrolment in many engineering disciplines, as illustrated in Chart 2.3. This is particularly notable for disciplines experiencing the highest growth of female-identifying students, such as software engineering, computer engineering, and biosystems engineering.



#### Chart 2.8 - Undergraduate degrees awarded to female-identified students by discipline (2022)

## Female-identified postgraduate student enrolment

The proportion of female-identified students enrolled in postgraduate engineering programs continues to grow, reaching 28.0 per cent in 2022. When comparing institutions that consistently replied to this survey since 2017, an increase in proportion of 0.6 percentage points from 2020 and 2.5 percentage points from 2017 was observed.



#### Chart 2.9 - Female-identified postgraduate student enrolment (2017-2022, full-time equivalent)

The highest proportions of female-identified postgraduate enrolment in 2022 were in British Columbia, Manitoba, and New Brunswick, with values of 31.5 per cent, 31.4 per cent, and 29.5 per cent, respectively.



Chart 2.10 - Female-identified postgraduate student enrolment by province (2022, full-time equivalent)

## Postgraduate degrees awarded to female-identified students

The number of postgraduate degrees awarded to female-identified students in 2022 consisted of 2,692 master's degrees and 426 doctoral degrees. When compared to 2020, this represented a 4.8 per cent increase in the number of master's degrees awarded and a 14.9 per cent increase for doctoral degrees awarded. When comparing institutions that consistently replied to this survey since 2017, the proportion of master's degrees awarded to female-identified students has increased from 25.5 per cent in 2020 to 26.7 per cent in 2022. The proportion of doctoral degrees awarded to female-identified students went from 22.4 per cent in 2020 to 25.8 per cent in 2022.



Chart 2.11 - Proportion of master's degrees awarded to female-identified students (2017-2022)



#### Chart 2.12 - Proportion of doctoral degrees awarded to female-identified students (2017-2022)

In 2022, the province with the largest proportion of master's degrees awarded to female-identified students was Manitoba, at 39.3 per cent. New Brunswick had the greatest percentage of female-identified students awarded doctoral degrees at 30.0 per cent. Conversely, the province with the smallest proportion of master's and doctoral degrees awarded to female-identified students was Newfoundland and Labrador, at 20.1 percent and Prince Edward Island at 0.0 percent.





# **International students**

#### International undergraduate enrolment

There were 15,365 international students enrolled in undergraduate engineering programs in 2022, accounting for 18.1 per cent of total enrolment. When comparing institutions that consecutively replied to this survey since 2017, international students represented 16.3 per cent of total undergraduate enrolment and 18.1 per cent in 2022 This means that the proportion of international students enrolled in undergraduate engineering programs has increased 11.1 per cent since 2017 and 0.7 per cent since the previous year.





## International undergraduate enrolment by discipline

In 2022 the disciplines with the highest proportion of international students enrolled were materials or metallurgical engineering (27.6 per cent) and industrial or manufacturing (23.7 per cent). Conversely, the programs with the lowest proportion of international students were engineering physics and geological engineering, at 10.5 per cent and 9.5 per cent, respectively.





## International undergraduate enrolment by province

Of the 15,365 international students enrolled in undergraduate engineering programs in Canada in 2022, 36.7 per cent (5,640 students) studied in Ontario and 25.7 per cent (3,946 students) studied in Quebec. Prince Edward Island and Newfoundland and Labrador had the highest proportion of international students enrolled at 43.4 per cent (119 students) and 30.8 per cent (302 students), respectively. The largest growth in international student enrolment over the previous year occurred in Price Edward Island (26.4 per cent) and Newfoundland and Labrador (16.4 per cent).





#### International undergraduate degrees awarded

In 2022, 2,791 of the 17,151 undergraduate degrees awarded were conferred on international students, representing 16.3 per cent overall. When comparing institutions that consecutively replied to this survey since 2017, the proportion of degrees awarded to international students has grown 31.0 per cent since 2017 and 8.1 percent since 2020.





International postgraduate student enrolment



Chart 3.5 - International postgraduate student enrolment (2017-2022, full-time equivalent)



Chart 3.6 - International postgraduate student enrolment by province (2022, full-time equivalent)

# International postgraduate degrees awarded

In 2022, the number of master's degrees awarded to international students totalled 7,079 and the number of doctoral degrees totalled 1004. When comparing institutions that consecutively replied to this survey, master's degrees awarded to international students increased by 20.4 percent since 2017 and 3.7 per cent over the previous year, while doctoral degrees awarded increased by 66.9 per cent since 2017 and 10.0 per cent over the previous year.

The proportion of postgraduate degrees awarded to international students reached 70.3 per cent of all master's degrees and 60.8 per cent of all doctoral degrees in 2022. This represents growth from 2017, when the proportion of master's degrees awarded was 58.4 per cent and that of doctoral degrees awarded was 36.4 per cent.







Chart 3.8 - Doctoral degrees awarded to international students (2017-2022)

In 2022, Newfoundland and Labrador, Saskatchewan and Nova Scotia had the greatest proportion of master's degrees awarded to international students at 95.2 per cent, 81.8 per cent, and 78.9 per cent, respectively. Similarly, Newfoundland and Labrador, Saskatchewan, and Manitoba awarded the greatest proportion of doctoral degrees to international students at 83.8 per cent, 79.6 per cent, and 62.5 per cent, respectively.



Chart 3.9 - Postgraduate degrees awarded to international students by province (2022)

# Indigenous student enrolment and degrees awarded

Of the 46 institutions that responded to the enrolment and degrees awarded survey, 20 provided information about Indigenous students. As the reported numbers are of a small magnitude, the data on Indigenous student enrolment is presented in a cumulative form to assure anonymity. While not all institutions are able to report Indigenous identity of their students, this data assists the engineering community in pursuing conversations on increasing the representation of Indigenous people in engineering. Even if a comprehensive and true representation of Indigenous student enrolment and degrees awarded is not available at this time, the data here provides an important starting point.

Of the 20 institutions who provided data, 18 institutions provided information on undergraduate Indigenous student enrolment. The institutions providing this data represent 48 per cent the total undergraduate enrolment in engineering programs in Canada. Eighteen institutions, representing 52.3 per cent of total degrees awarded, provided information on undergraduate degrees awarded to Indigenous students. In addition, 12 institutions, representing 41.4 per cent of postgraduate student enrolment, provided data on Indigenous student postgraduate enrolment. Finally, 12 institutions, representing 42.4 per cent of all postgraduate degrees awarded, provided data on Indigenous student postgraduate degrees awarded.

While Indigenous people make up 4.9 per cent of the population in Canada[1], Indigenous students only account for 0.6 per cent of total undergraduate enrolment in engineering programs and 0.8 per cent of undergraduate degrees awarded. Postgraduate student enrolment is 0.3 per cent of total enrolment, and 0.2 per cent of postgraduate degrees were awarded to Indigenous students.





[1] Government of Canada. Aboriginal peoples in Canada: Key results from the 2017 Census. *The Daily*, Oct October 25, 2017, https://www150.statcan.gc.ca/n1/daily-quotidien/171025/dq171025a-eng.htm? indid=14430-1

# **Faculty members**

There was a total of 4,941 full-time equivalent engineering faculty members across Canada in 2022. When comparing institutions that consecutively replied to this survey since 2017, the number of full-time equivalent faculty members has increased by 0.9 per cent since 2020 and 15.6 per cent since 2017. The proportion of female-identified faculty increased from the previous year from 17.8 per cent to 19.5 per cent.







Chart 5.2 - Female-identified faculty members (2022, full-time equivalent)



Chart 5.3 - Proportion of female-identified faculty members (2008-2022, full-time equivalent)

# Appendix A

Data found in the following tables can be downloaded in Excel format.

#### Undergraduate Enrolment (U)

- U.1. National
- U.2. Provincial
- U.3. Institutional

#### Undergraduate Degrees Awarded (UD)

- UD.1. National
- UD.2. Provincial
- UD.3. Institutional

#### Postgraduate Student Enrolment (G)

- G.1. National
- G.2. Provincial
- G.3. Institutional

#### Postgraduate Degrees Awarded (GD)

- GD.1. National
- GD.2. Provincial
- GD.3. Institutional

#### Faculty Members by institution (F)

F.1. Faculty composition

#### Co-op, Internship, and Professional Experience Programs (C)

C.1. Industry experience options by institutions