



# 2019 Canadian Engineers for Tomorrow

Trends in Engineering Enrolment and Degrees Awarded 2019

### **Trends in Engineering Enrolment and Degrees Awarded 2015-2019**

#### Message from the Chief Executive Officer



Engineers Canada is pleased to publish the 2020 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 2015 through 2019.

Canadian post-secondary institutions continue to report a strong growth in undergraduate degrees awarded, presenting 24.7 per cent more engineering degrees in 2019 than in 2015. It is once again positive to see that most engineering disciplines awarded more degrees in 2019 than in 2015, 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 female students enrolled in undergraduate and postgraduate programs, as well as the proportion receiving undergraduate degrees, has reached an all-time high. As of 2019, females comprised 23.4 per cent of undergraduate students, 26.6 per cent of postgraduate students, and 22.1 per cent of undergraduate engineering degrees awarded. As the profession moves toward achieving 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 2019, the number of international undergraduate students reached 15,278, or 17.3 per cent of total undergraduate engineering enrolment.

For the fifth 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 ten 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.

Gerard McDonald, MBA, P.Eng. Chief Executive Officer

#### Acknowledgements

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## 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 2020, 45 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, and gender, as well as the number of engineering graduates available to enter the labour market and international students' participation in Canadian engineering education. Enrolment trends at the undergraduate, master's, and doctoral levels are compared, along with male and female students studying and graduating from engineering programs. For the fifth 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 (HEIs) 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

#### 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 6 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.

## **Undergraduate students**

#### Total undergraduate student enrolment

Undergraduate student enrolment in accredited engineering programs totalled 88,273 in 2019. This is an increase of 7.0 per cent from 2015 and a 1.0 per cent decrease from 2018.



#### Total undergraduate student enrolment by discipline

The undergraduate engineering disciplines with the highest enrolment in 2019 were mechanical engineering, civil engineering, and electrical engineering, representing 21.7 per cent, 13.8 per cent, and 12.2 per cent of total undergraduate enrolment, respectively. Conversely, the fields that accounted for the smallest proportion of undergraduate enrolment were geological engineering (0.7 per cent), materials or metallurgical engineering (1.0 per cent), and mining or mineral engineering (1.1 per cent).

Environmental engineering (57.6 per cent), computer engineering (14.5 per cent), and biosystems engineering (13.8 per cent) demonstrated the highest growth since the previous year. Similarly, the disciplines that experienced the largest cumulative growth from 2015 were biosystems engineering (72.9 per cent), software engineering (67.2 per cent), and computer engineering (52.7 per cent). Conversely, engineering physics (-43.1 per cent), mining or mineral engineering (-14.3 per cent), and electrical engineering (-11.1 per cent) had the largest decline from the previous year.

Additionally, seven disciplines presented a decline in enrolment since 2015: engineering physics (-53.4 per cent), mining and mineral engineering (-33.0 per cent), geological engineering (-22.5 per cent), materials of metallurgical engineering (-11.9 per cent), electrical engineering (-8.3 per cent), chemical engineering (-3.1 per cent), and civil engineering (-3.1 per cent). Once again, these comparisons were made between institutions that consecutively replied to the enrolment and degrees awarded survey since 2015.



#### Total undergraduate student enrolment by province

The highest proportion of undergraduate enrolment continues to be located in the provinces of Ontario and Quebec. In 2019, these provinces accounted for 45.5 per cent and 24.3 per cent of total enrolment, respectively. Furthermore, British Columbia and Ontario underwent the largest percentage increase in enrolment from the previous year, with growth of 19.1 per cent in British Columbia and 7.4 per cent in Ontario.

The highest cumulative enrolment growth from 2015 occurred in Prince Edward Island (89.1 per cent) and British Columbia (20.1 per cent).

Quebec (-20.7 per cent), Nova Scotia (-8.5 per cent), and Newfoundland and Labrador (-1.9 per cent) were the only provinces to experience a decrease from the previous year. New Brunswick (-7.3 per cent), Saskatchewan (-5.5 per cent), and Nova Scotia (-1.8 per cent) were the only provinces to experience a decrease in enrolment since 2015.

Once again, these comparisons were made between institutions that consecutively replied to the enrolment and degrees awarded survey since 2015.



#### Total undergraduate degrees awarded

The number of undergraduate degrees awarded totalled 18,154 in 2019, which is an increase of 10.0 per cent from the previous year. This is a noteworthy increase when compared to the average annual increase of 5.7 per cent for the period of 2015 to 2019. Cumulatively, the number of degrees awarded across Canada has increased 24.7 per cent from 2015. Once again, these comparisons were made between institutions that consecutively replied to the enrolment and degrees awarded survey since 2015.



Chart 1.5 shows that Nova Scotia, Quebec, and Prince Edward Island had the highest increases in undergraduate degrees awarded from 2018, with growths of 81.0 per cent, 43.5 per cent, and 29.4 per cent, respectively. Similarly, Nova Scotia, Quebec, and New Brunswick experienced the highest increases in undergraduate degrees awarded from 2015, with growth of 124.9 per cent, 53.2 per cent, and 36.5 per cent, respectively.

Saskatchewan (-8.5 per cent), Manitoba (-7.3 per cent), Ontario (-5.7 per cent), Alberta (-3.0 per cent), and Newfoundland and Labrador (-3.0 per cent) experienced decreases in undergraduate degrees awarded from the previous year, while only Saskatchewan (-4.7 per cent) has experienced a decrease in undergraduate degrees awarded from 2015. Once again, these comparisons were made between institutions that consecutively replied to the enrolment and degrees awarded survey since 2015.



Mechanical engineering, civil engineering, and electrical engineering awarded the greatest number of degrees in 2019, representing 25.0 per cent, 16.9 per cent, and 13.4 per cent of the total, respectively. Furthermore, software engineering exhibited the largest growth in degrees awarded from 2018 (52.0 per cent) and biosystem engineering exhibited the largest growth in degrees awarded from 2015 (122.6 per cent).

Engineering physics (-44.9 per cent), geological engineering (-16.7 per cent), mining or mineral engineering (-10.1 per cent), and materials or metallurgical engineering (-6.0 per cent) were the only disciplines to display decreases since 2015 in the number of undergraduate degrees awarded. Engineering physics (-26.5 per cent), geological engineering (-15.8 per cent), mining or mineral engineering (-6.4 per cent), and chemical engineering (-1.4 per cent) saw a decrease since 2018.



# **Postgraduate students**

#### Total postgraduate student enrolment

Postgraduate student enrolment totalled 29,239 in 2019. When comparing institutions that consecutively replied to this survey since 2015, graduate student enrolment increased by 13.2 per cent from 2018 and 31.4 per cent from 2015, averaging a 7.1 per cent annual growth rate.



The province that experienced the highest growth in postgraduate enrolment over the previous year as well as displayed the highest cumulative growth since 2015 (78.9 per cent) was New Brunswick (81.8 per cent). The only province to observe a decrease from 2018 was Prince Edward Island (-5.8 per cent) and no province reported a decrease in postgraduate student enrolment from 2015. Once again, these comparisons were made between institutions that consistently reported to the enrolment and degrees awarded survey since 2015.



equivalent)

#### Total postgraduate degrees awarded

A total of 8,897 master's and 1,685 doctoral of engineering degrees were awarded in 2019, for a combined sum of 10,582 postgraduate degrees. This corresponds to a growth of 14.6 per cent in master's degrees awarded and 7.1 per cent in doctoral degrees awarded from 2018. Similarly, there was a cumulative growth of 39.7 per cent in master's degrees awarded and 23.6 per cent in doctoral degrees awarded since 2015.



Newfoundland and Labrador had the largest growth in the number of postgraduate degrees awarded in 2018 (114.0 per cent) and New Brunswick had the largest growth since 2015 (183.3 per cent).

Chart 1.10 indicates the average growth in master's degrees awarded by province for the periods of 2015 to 2019 and 2018 to 2019, while Chart 1.11 indicates the same trend for doctoral degrees. Once again, these comparisons were made between institutions that consecutively replied to the enrolment and degrees awarded survey since 2015.



## **Female students**

#### Female undergraduate enrolment

Female undergraduate enrolment remained above 20 per cent in 2019, with a 1.4 per cent increase from 22.0 per cent in 2018 to 23.4 per cent in 2019. The total number of females enrolled in undergraduate-level engineering programs has increased by 5.3 per cent since 2018 and 26.5 per cent since 2015.



#### Female undergraduate enrolment by discipline

The disciplines that experienced the highest proportion of female undergraduate enrolment in 2019 were biosystems engineering (50.2 per cent), chemical engineering (41.4 per cent), and geological engineering (38.8 per cent).

The disciplines with the lowest percentages of female undergraduate enrolment were software engineering (15.6 per cent), mechanical engineering (16.1 per cent), computer engineering (16.6 per cent), and electrical engineering (16.6 per cent). While these four disciplines account for 50.1 per cent of the total number of undergraduate students, they only account for 35.0 per cent of the total number of female undergraduate students.

Furthermore, the disciplines that presented the highest growth in the proportion of female students from 2018 were environmental engineering, computer engineering, and software engineering which rose 27.3 per cent, 21.6 per cent, and 17.2 in 2019, respectively.

Similarly, the disciplines that experienced the highest growth in the proportion of female students from 2015 were software engineering, computer engineering and biosystems engineering, which rose 110.6 per cent, 109.6 per cent and 93.0 per cent in 2019, respectively.





#### Female undergraduate enrolment by province

Newfoundland and Labrador had the highest percentage of female undergraduate students (26.5 per cent), while Saskatchewan had the lowest (19.2 per cent). As is observable in Chart 2.5, six provinces experienced increases in female undergraduate enrolment since 2018, while seven provinces experienced increases since 2015. Once again, these comparisons were made between institutions that consecutively replied to the enrolment and degrees awarded survey since 2015.



#### Undergraduate degrees awarded to female students

Of the 18,154 engineering degrees awarded in 2019, 4,017 were awarded to females, accounting for 22.1 per cent of the graduates. When comparing engineering programs that consecutively replied to this survey, increases of 15.2 per cent from 2018 and 53.6 per cent from 2015 were observed.



The provinces with the highest proportion of undergraduate degrees awarded to female students are Newfoundland and Labrador (27.0 per cent), followed by Alberta (24.6 per cent), and Nova Scotia (23.9 per cent). Additionally, New Brunswick had the greatest increase in the proportion of undergraduate degrees awarded to female graduates when compared to 2018, with a growth of 3.2 percentage points overall.



The disciplines that had the highest growth over the previous year in the proportion of undergraduate degrees awarded to female graduates were that of materials or metallurgical engineering (9.9 percentage points increase) and geological engineering (7.3 percentage points increase). The categories that experienced the highest growth from 2015 were those of materials or metallurgical engineering (16.3 percentage points increase) and biosystems engineering (6.0 percentage point increase).

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



#### Female postgraduate student enrolment

The proportion of female students enrolled in postgraduate engineering programs continues to grow, reaching 26.6 per cent in 2019. When comparing institutions that consistently replied to this survey since 2015, an increase in proportion of 0.3 percentage points from 2018 and 2.6 percentage points from 2015 was observed.



The highest proportions of female postgraduate enrolment in 2019 were in Prince Edward Island, Manitoba, and Nova Scotia, with values of 35.0 per cent, 30.4 per cent, and 29.1 per cent, respectively.



#### Postgraduate degrees awarded to female students

The number of postgraduate degrees awarded to female students in 2019 consisted of 1,868 master's degrees and 394 doctoral degrees. When compared to 2018, this represented a -4.7 per cent decrease in the number of master's degrees awarded and a 0.3 per cent increase for doctoral degrees awarded. When comparing institutions that consistently replied to this survey since 2015, the proportion of master's degrees awarded to female students has decreased from 25.2 per cent in 2018 to 21.0 per cent in 2019, the proportion of doctoral degrees awarded to female students went from 24.9 per cent in 2018 to 23.4 per cent in 2019.





In 2019, the province with the largest proportion of master's degrees awarded to female students was British Columbia, at 29.6 per cent, while Alberta had the greatest percentage of female students receiving doctoral degrees at 29.1 per cent. Conversely, Prince Edward Island had the smallest percentage of master's degrees awarded to female students (13.7 per cent), while Prince Edward Island awarded no doctoral degrees to female graduates in 2019, the province with the lowest actual award rate was New Brunswick (2.8 per cent).



# **International students**

#### International undergraduate enrolment

There were 15,278 international students enrolled in undergraduate engineering programs in 2019, accounting for 17.3 per cent of total enrolments. When comparing institutions that consecutively replied to this survey since 2015, international students represented 15.7 per cent of total undergraduate enrolment and 15.6 per cent in 2018. This means that the proportion of international students enrolled in undergraduate engineering programs has increased 10.0 per cent since 2015 and 10.8 per cent since the previous year.



#### International undergraduate enrolment by discipline

Materials or metallurgical engineering, and mining or mineral engineering had the highest proportion of international students enrolled, at 35.3 per cent and 24.1 per cent, respectively. Conversely, the programs with the lowest proportion of international students were engineering physics and geological engineering, at 9.2 per cent and 9.3 per cent, respectively.



#### International undergraduate enrolment by province

Out of the 15,278 international students enrolled in undergraduate engineering programs in Canada in 2019, 41.8 per cent (6,386) studied in Ontario and 22.5 per cent (2,424) studied in Quebec. Nova Scotia and Prince Edward Island had the highest proportion of international students enrolled at 33.2 per cent (2,056 students) and 27.7 per cent (242 students), respectively. The largest growth in international student enrolment over the previous year occurred in Price Edward Island (23.9 per cent) and British Columbia (21.3 per cent).



#### International undergraduate degrees awarded

In 2019, 2,751 of the 18,154 undergraduate degrees awarded were conferred on international students, representing 15.2 per cent overall. When comparing institutions that consecutively replied to this survey since 2015, the proportion of degrees awarded to international students has grown 3.5 per cent since 2018 and 33.4 per cent since 2015.



Chart 3.4 - Undergraduate degrees awarded to international students (2015-2019)

#### International postgraduate student enrolment





#### International postgraduate degrees awarded

In 2019, the number of master's degrees awarded to international students totalled 6,016 and the number of doctoral degrees totalled 918. When comparing institutions that consecutively replied to this survey, master's degrees awarded to international students increased by 5.6 per cent over the previous year and 26.4 per cent from 2015, while doctoral degrees awarded decreased by 2.8 per cent over the previous year and increased 72.4 per cent from 2015.

The proportion of postgraduate degrees awarded to international students reached 67.6 per cent of all master's degrees and 54.5 per cent of all doctoral degrees in 2019. This represents growth from 2015, when the proportion of master's degrees awarded was 53.5 per cent and that of doctoral degrees awarded was 31.6 per cent.



awarded to international students (2015-2019)



In 2019, Newfoundland and Labrador, Nova Scotia, and Saskatchewan had the greatest proportion of master's degrees awarded to international students at 84.4 per cent, 82.8 per cent, and 76.9 per cent, respectively. Similarly, New Brunswick, Newfoundland and Labrador, and Alberta awarded the greatest proportion of doctoral degrees to international students at 83.3 per cent, 74.3 per cent, and 71.8 per cent, respectively.



# Indigenous student enrolment and degrees awarded

Of the 45 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 the 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, 16 institutions provided information on undergraduate Indigenous student enrolment, representing 40.5 per cent of all undergraduate students enrolled in engineering programs in Canada, and 16 institutions provided information on undergraduate degrees awarded to the same, representing 40.1 per cent of the total number undergraduate degrees awarded across Canada. Furthermore, 10 institutions provided data on Indigenous student enrolment in graduate programs, representing 37.6 per cent of postgraduate students in Canada. Eight institutions provided data on postgraduate degrees awarded to Indigenous peoples', representing 33.7 per cent of all postgraduate degrees awarded across Canada.

While Indigenous peoples make up 4.9 per cent of the population in Canada<sup>1</sup>, Indigenous students only account for 0.6 per cent of total undergraduate enrolment in engineering programs and 0.7 per cent of undergraduate degrees awarded. Postgraduate student enrolment is 0.1 per cent of total enrolment, and 0.1 per cent of postgraduate degrees were awarded to Indigenous students.

[1]Government of Canada. Aboriginal peoples in Canada: Key results from the 2016 Census. The Daily, 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 4,912 full-time equivalent engineering faculty members across Canada in 2019. When comparing institutions that consecutively replied to this survey since 2015, the number of full-time equivalent faculty members has increased by 4.6 per cent since 2018 and 16.2 per cent since 2015. The proportion of female faculty decreased from the previous year from 20.8 percent to 16.8 percent.



Small inaccuracies in the reported data as well as changes in programming will affect the percentage presented in Chart 5.3.

# **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