

Australian Engineering Education Factsheet

April 2017

An update on the status and trends in Australia's higher education system for engineering

Introduction

Australia has a mature university-based engineering education system that produces graduates qualified to commence supervised practice, and advance their knowledge and skills. The system provides higher degree research training and undertakes research in engineering science and practice. This Factsheet provides a national snapshot of the system, using the most recent national data.

System Size

Currently 35 public universities, several TAFE Institutes, and a small number of private colleges are providing higher education (HEd) qualifications in engineering¹ at levels 6-10 of the *Australian Qualifications Framework* (AQF).

Overall, in 2015, engineering had 106,210 enrolled students, some 7.5% of total national higher education enrolments. International students constitute 35.9% of the enrolments in engineering qualifications. The total 'engineering load' in 2015 was 71,201 equivalent full-time students, taking into account students' study patterns.

In 2015, there were more than 4,200 full-time equivalent academic staff (18% women) in the university engineering faculties and schools. Approximately 1,800 of the staff were in 'research-only' positions.

Coursework Programs

Engineering graduate numbers from each of the principal award categories, for 2005, 2010 and 2015, were:

award level	2005		2010		2015	
	Dom	Int	Dom	Int	Dom	Int
Masters	635	2,299	1,024	2,660	1,543	3,205
Other PG	363	195	672	279	848	160
Bach (4-yr)	5,680	2,396	5,775	2,571	7,219	3,239
Bach (3-yr)			452	395	524	251
Ass Deg/AD	141	49	320	97	570	129
TOTALS	6,819	4,939	8,243	6,002	10,704	6,984

Commencing student numbers for the same years were:

award level	2005		2010		2015	
	Dom	Int	Dom	Int	Dom	Int
Masters	876	2,579	1,541	2,770	2,091	5,473
Other PG	1,103	260	1,132	315	844	177
Bachelors	9,916	3,782	12,541	6,626	14,896	6,510
Ass Deg/AD	419	149	1,357	157	1,178	196
TOTALS	12,314	6,770	16,571	9,868	19,009	12,356

¹ The data are for the field of education *Engineering and Related Technologies*. This includes civil aviation and surveying, areas that have small student enrolments.

These data show:

- growth in domestic commencing enrolments in Bachelor degrees that is in line with the growth of total domestic commencing enrolments;
- expansionary growth in international enrolments in Master (ME) degrees, particularly into new, accredited, 'entry-to-practice' programs (see below).

The average **graduation rate** for students commencing an engineering Bachelor degree is approximately 65%. Graduation may be from a different institution than that of commencement, and may be up to a decade later, allowing for part-time study and study breaks.

The **basis of admission** of domestic students into Bachelor degrees has diversified over time. As the total number of commencements has increased, relatively fewer enter on the basis of schooling, and more have prior HEd studies:

Basis of Admission	2004	2011	2015
secondary school	71.1%	64.9%	58.3%
VET/TAFE	6.8%	7.4%	6.5%
higher education	14.4%	18.5%	22.5%
other	7.7%	9.0%	12.7%

External accreditation by the professional body, *Engineers Australia*, is valued by providers. The accreditation standards are set by the practicing profession, and are benchmarked to international agreements².

Since 1980, the standard accredited *professional engineering* qualification has been the 4-year degree, often awarded with a class of Honours. Since 2014, providers have made these degrees compliant with the requirements of the AQF level 8, Bachelor (Honours) degree specification.

Since the mid-2000's, an increasing number of providers have offered ME degrees that are accredited for entry-to-practice at the level of professional engineer. Two universities have ceased offering BE(Hons) degrees. Most of their students commence university study by taking the engineering major in a Bachelor of Science degree.

Three-year Bachelors degrees and 2-year Associate Degrees (and Advanced Diplomas) may be accredited at the qualification levels for the occupations of *engineering technologist* and *engineering associate*, respectively.

Bachelor degree commencing numbers for engineering therefore underestimate the numbers heading for an engineering qualification. The Master graduate numbers combine those from entry-to-practice degrees and from Masters degrees designed for qualified engineers.

² The Washington, Sydney and Dublin Accords, of the International Engineering Alliance. <http://www.ieagreements.org/>

The participation of women in engineering coursework programs has not increased substantially over the decade, indicated by these figures for commencing students:

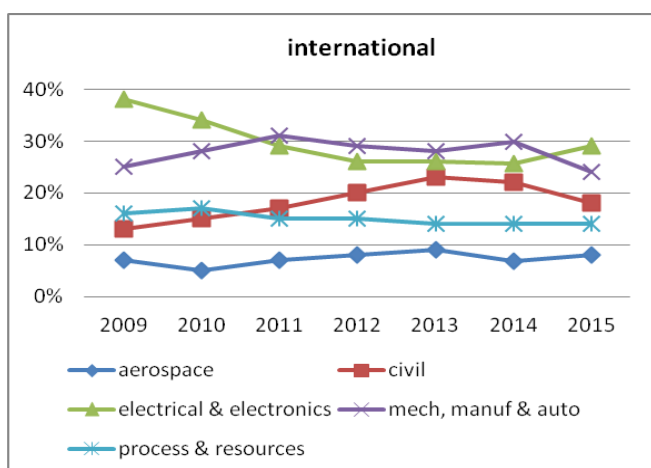
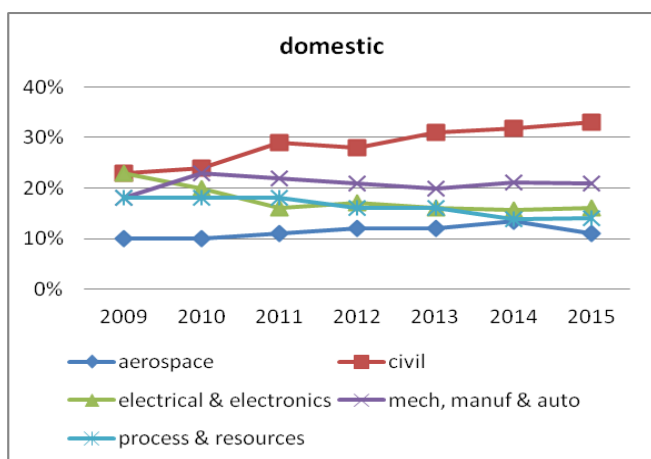
	2005		2010		2015	
	Dom	Int	Dom	Int	Dom	Int
Masters	17.0%	16.9%	16.7%	20.0%	18.7%	20.3%
Bachelors	12.7%	17.7%	14.4%	15.1%	15.2%	21.0%

Women constitute slightly higher proportions of the graduate cohorts, as a result of their stronger academic performance.

The numbers of Indigenous students and graduates in engineering is very small. In 2015 there were only 49 Indigenous graduates recorded as having graduated from engineering with any higher education qualification.

Engineering has distinct areas of practice that are reflected by strongly differentiated degree programs. New branches, such as environmental engineering and biomedical engineering, are created from time to time, reflecting industrial, economic, technological and social needs.

The following charts show graduations in five established branches, aggregated over all undergraduate awards, for 2009-15. The relative proportions may reflect perceptions of Australian, regional and global demand for engineers.



Graduate employment rates and starting salaries have been consistently higher than those of graduates of other STEM-based areas for many years.

The 2015 Bachelor degree graduates in engineering ranked 4th on median starting salary at \$62,000. Women earned \$3,000 more than men. At 80%, the engineers' average full-time employment rate was 20% higher than the average for graduates from all fields of education.

The median salary for engineering Master degree graduates completing in 2015 was \$100,000. This figure is probably dominated by mature individuals already employed in engineering.

Higher Degrees by Research (HDR)

The engineering faculties and schools have nearly doubled their production of HDR graduates since 2005, mostly from increasing numbers of international students:

award	2005		2010		2015	
	Dom	Int	Dom	Int	Dom	Int
PhD	452	185	474	318	603	656
Master	133	75	99	97	108	121
TOTALS	585	260	573	415	711	777

The 2015 engineering total represents 14.8% of total HDR graduations. The strong internationalisation of Australia's engineering research effort is reflected by continuing increases in higher degree commencements.

The proportion of women in both domestic and international cohorts has been around 25% for several years. This will potentially increase the proportion and numbers of women in the academic and research engineering workforce.

Research

The faculties and schools contribute to Australia's research outcomes. For engineering, external research income in four categories for 2013 and three research outcome metrics are shown in the following table. The share of the national total for each measure is also provided.

Research income (2013) / Research metric (HERDC data)	Engin'ing	% of nat total
Cat 1 Australian competitive grants	\$ 153.8 M	8.9%
Cat 2 Other public sector income	\$ 73.6 M	8.6%
Cat 3 Industry & other research inc.	\$ 106.0 M	13.6%
Cat 4 CRC research income	\$ 34.5 M	33.0%
Research commercialisation inc. (2013)	\$ 4.9 M	8.4%
Patents granted (2011-13)	293.3	31.3%
Research esteem factors (2011-13)	312.9	6.3%

The importance of CRC and industry funding for engineering research is evident. Engineering produced nearly one third of the national patents granted.

The high quality of the engineering research can be deduced from national Excellence in Research Australia (ERA) data. In the 2015 ERA report, 27 universities had at least one area of engineering rated at level 4 (performance above world standing) or higher. Six institutions had five or more engineering areas rated at level 5. This level was attained in materials engineering by 14 institutions, and by 10 institutions in electrical & electronic engineering.

Australian Council of Engineering Deans Inc.

The membership of the Inc. (ACED) is a senior academic representative of each of the 35 Australian universities that provide professional engineering degrees accredited by Engineers Australia. ACED's mission is to promote and advance engineering education, research and scholarship on behalf of the Australian higher education system.

More data and trends on engineering enrolments and staffing are on the ACED website: www.aced.edu.au

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