

FROM A LEVELS TO ENGINEERING

Exploring the gender gap
in higher education



From A levels to engineering

WOMEN IN HIGHER EDUCATION



First year undergraduates in **engineering and technology**

18%
women

First year undergraduates in **all subjects**

57%
women



A LEVELS BREAKDOWN

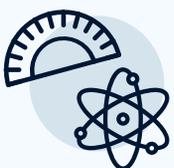
First year undergraduates who have studied A level in maths and physics:



Maths **and** physics
22% women



Maths **only**
50% women

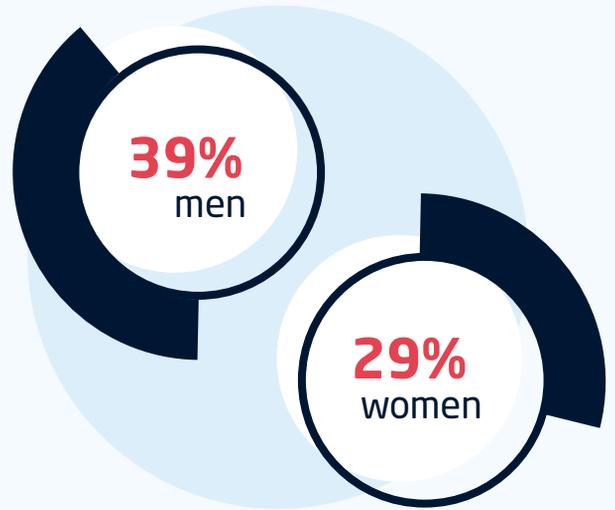


Maths **and/or** physics
40% women



Physics **only**
31% women

ENGINEERING AND TECHNOLOGY IS THE TOP HE STUDY SUBJECT FOR STUDENTS STUDYING BOTH MATHS AND PHYSICS SUBJECTS AT A LEVEL



CLOSING THE GAP

Students who studied maths and/or physics at A level who went on to become **engineering and technology undergraduates**:



23% men



8% women

Number of girls needed to study A levels to reach the same number of women undergraduates in **engineering and technology as men**:

Maths and/or physics:

150,000
girls

=

115,000⁺
on current numbers

Maths and physics:

33,000
girls

=

26,000⁺
on current numbers





In engineering, women are in the minority at just 16.5% of the workforce. In fact, gender disparity is seen throughout all educational pathways into engineering.

Here we explore how many more girls would need to study mathematics and/or physics at A level to increase the numbers of women studying engineering in higher education to the same level as men. We do this by exploring the conversion rates from A level to engineering and technology degrees for first year undergraduate students by gender, with the aim of estimating the additional numbers needed per year.

Data from the Higher Education Statistics Agency (HESA) shows there were close to 627,000 first year undergraduate students in 2020/21, with around 38,500 of those studying an engineering and technology degree. The gender disparity is clear within engineering and technology as only 18% of those were women, compared to 57% for all subjects combined. This is perhaps not surprising given the prerequisite for many degrees in engineering and technology is an A level in both maths and physics and, of the students in higher education who had studied both subjects, just 22% were women (figure 1).

Looking at students who studied maths at A level, 40% of all maths students (including those who also studied physics) were women, as were half of students who studied only maths (and not physics). These students would have potential to study some engineering higher education courses where prior in-depth physics knowledge may not be required to progress.

We next look at men and women separately, how many of those recorded as having studied maths and/or physics at A level had then gone on to study engineering and technology in higher education (figure 2).

FIGURE 1:

First year undergraduate students who have studied A levels in mathematics and physics and percentage of those who were women, UK, 2020/21

A level studies	Number of students	%women
Combination of the 2 subjects		
Maths AND physics	31,885	22%
Maths AND/OR physics	92,795	40%
Subject, irrespective of if they studied the other subject		
Maths	88,185	40%
Physics	36,495	24%
Single subject only (did not study the other subject)		
Maths only	56,300	50%
Physics only	4,610	31%

Source: HESA student record, 2020/21. Numbers rounded to the nearest 5.

It is important to consider the different combinations of study for A levels and progression into higher education to explore where there is potential to increase female participation.

The HESA data shows that 12,715 first year undergraduate men who had studied either maths or physics or both at A level, went on to study engineering and technology in higher education, which is 23% of all men who had studied at least one of the subjects. In contrast, just 3,100 (8%) of first year undergraduate women who had studied maths and/or physics at A level went on to study engineering and technology degrees.

If the 8% remains constant, around 150,000 girls would need to study A levels in one or both subjects in order to reach the same number of women studying engineering and technology as men, which represents an increase of around 115,000 on current numbers.



Of these students, there were 9,750 first year undergraduate men who had studied both maths and physics A levels and went on to study engineering, representing 39% of all students who had studied both subjects at A level. This is compared to just 2,110 of their female counterparts.

Assuming the rate of conversion remains the same (29%), we would need approximately 33,000 girls to study both subject A levels, which is an increase of around 26,000 on current numbers.

Additionally, it is important to look at what those students who study maths and/or physics A levels are studying if they don't choose engineering and technology degrees, to understand where they are going.

Encouragingly, for those studying both subjects at A level (figure 3), the top subject of study for both men and women is engineering and technology with 39% of men and 29% of women choosing this option.

For both genders, this is also followed by physical sciences¹ (16% of men and 20% of women), and 11% chose mathematical sciences.

Computing appears in the top 5 for both men and women, but also with a gender gap, as 13% of men compared to 6% of women chose the subject in higher education.

FIGURE 2:

First year undergraduate students who have studied A levels in mathematics and physics and then study engineering and technology, by gender, UK, 2020/21

Marker	Men			Women		
	No. of students	No. of students in engineering	% in engineering studies	No. of students	No. of students in engineering	% in engineering studies
Combination of the 2 subjects						
Maths AND physics	24,720	9,750	39%	7,160	2,110	29%
Maths AND/OR physics	55,925	12,715	23%	36,870	3,100	8%
Subject, irrespective of if they studied the other subject						
Maths	52,745	12,170	23%	35,440	3,025	9%
Physics	27,900	10,300	37%	8,595	2,185	25%
Single subject only (did not study the other subject)						
Maths only	28,025	2,420	9%	8,595	915	3%
Physics only	3,180	550	17%	1,435	75	5%

Source: HESA student record, 2020/21. Numbers rounded to the nearest 5.

¹ Physical sciences includes chemistry, materials science, physics, archaeology as a physical science, astronomy, geology, oceanography, geography studies as a science, environmental science & other physical sciences



FIGURE 3:

Top 5 subjects studied by first year undergraduate students with A level maths AND physics, by gender, UK, 2020/21

Top 10 subjects studied by men with maths AND physics A level	% studying	Top 10 subjects studied by women with maths AND physics A level	% studying
Engineering and technology	39%	Engineering and technology	29%
Physical sciences	16%	Physical sciences	20%
Computing	13%	Mathematical sciences	11%
Mathematical sciences	11%	Computing	6%
Social sciences	5%	Architecture, building and planning	5%

Source: HESA student record, 2020/21 . Numbers rounded to the nearest 5.

When we look at students who had studied either maths or physics or both (figure 4), there are differences by gender between the top subjects studied at higher education. For men, the top subject is engineering and technology (23%) followed by computing (12%) and social sciences (11%).

On the other hand, for women, engineering and technology appears fourth on the list (8%) behind subjects allied to medicine (13%), medicine and dentistry (10%) and social sciences (9%). Physical sciences also appears in the top 5 for both men and women and at similar rates (9% and 8% respectively).

The question remains whether A level maths and physics need to continue to be prerequisites for engineering and technology degrees. Understandably there are some degrees where the prior knowledge is required, but in order to address the gender imbalance on engineering and technology courses, perhaps some further thought needs to be taken in relation to making it more accessible to a wider range of applicants.

FIGURE 4:

Top 5 subjects studied by first year undergraduate students with A level maths and/or physics, by gender, UK, 2020/21

Top 10 subjects studied by men with maths AND/OR physics A level	% studying	Top 10 subjects studied by women with maths AND/OR physics A level	% studying
Engineering and technology	23%	Subjects allied to medicine	13%
Computing	12%	Medicine and dentistry	10%
Social sciences	11%	Social sciences	9%
Business and management	10%	Engineering and technology	8%
Physical sciences	9%	Physical sciences	8%

Source: HESA student record, 2020/21 . Numbers rounded to the nearest 5.