



**Advanced Mathematics
Support Programme®**



Further Maths: A university perspective

Continuing Professional
Development
Standard

National Centre
for Excellence in the
Teaching of Mathematics



Why study Further Maths?

- It's fun!
- Spending more time on maths at A level;
- It can aid in making a successful transition to higher education;
- Materials met in Further Maths will likely be quickly be met at university (and will covered more quickly than they would have covered it at school);
- Some courses will require / show a preference for Further Maths.

FM as prep for a Maths Degree

Students with an AS / A level in Further Maths will have encountered topics like:

- Proof by induction
- Matrices
- Complex numbers
- Maclaurin series
- Volumes of revolution
- More advanced differential equations
- More statistics / mechanics
- Discrete / decision maths

FM as prep for other degrees?

- In which subjects are your students likely to encounter further mathematics topics at university?
- Why are further mathematics topics needed in these subjects?

Fill in the blanks...

- Calculations in ???
- Mathematics for ???
- Mathematical and Experimental Tools Required in ???
- Computational ???
- Newtonian Dynamics
- Advanced Calculus and Differential Equation Techniques
- Statistical Thermodynamics
- Statistical Mechanics
- Symmetry & Group Theory in ???

Fill in the blanks...

- Calculations in Chemistry
- Mathematics for Chemists
- Mathematical and Experimental Tools Required in Chemistry
- Computational Chemistry
- Newtonian Dynamics
- Advanced Calculus and Differential Equation Techniques
- Statistical Thermodynamics
- Statistical Mechanics
- Symmetry & Group Theory in Chemistry

Are students aware?

“Students are often surprised at the extent of the mathematical demands of their university programmes and some struggle to cope with those demands. For example, over 80 per cent of economics students surveyed stated there was much more mathematics involved in their economics degree programme than they expected.”

(Source: Dawson P (2014) *Skills in mathematics and statistics in economics and tackling transition* (York: Higher Education Academy), https://www.heacademy.ac.uk/system/files/resources/tt_maths_economics.pdf)

AMSP Research

- What are the current entry requirements relating to Mathematics and Further Mathematics?
- The AMSP carried out analysis of entry requirements and statements from over 940 degree courses to establish what prior maths qualifications they require for entry in 2020. The analysis was undertaken in August - November 2019.

HE entry requirements - STEM

Subject	No. of courses	Maths		Further Maths	
		Required	Preferred	Required	Preferred
Mathematics G100	68	99%	1%	10%	21%
Physics F300	43	100%	0%	0%	7%
Aeronautical Engineering H400	27	96%	0%	0%	11%
Chemical Engineering H800	25	96%	0%	0%	16%
Mechanical Engineering H300	67	91%	6%	0%	7%
Electrical Engineering H600	60	87%	8%	0%	7%
<i>All courses surveyed</i>	754	56%	3%	1%	6%

AMSP, Nov 2019

Examples of positive FM statements

- *ABC including an A in Mathematics. ABD including Mathematics at grade A and Further Mathematics at grade B.*

Mathematics, University of Kent

- *A* (Mathematics) AA to A (Mathematics) AA. A-level Further Maths is preferred but not essential. Those offering Further Maths are more likely to receive the AAA offer.*

Mathematics, University of Manchester

Examples of positive FM statements

- *... Further Mathematics A-level is useful, but not an essential requirement for entry. As Mathematics is the largest module in our first and second year, students who have taken Further Mathematics have less new material to study. In recent years, about ten percent of our cohort have taken a combination of A-levels which does not include Further Mathematics. If you are not taking Further Mathematics, you may consider studying relevant topics independently.*

Mechanical Engineering, Imperial

Examples of positive FM statements

- *Further Mathematics is also recommended to aid university preparation but will not affect an offer.*

Physics, University of Glasgow

Examples of positive FM statements

- *A Levels AAB, including Maths and either Physics, Chemistry or Electronics. A Levels + additional qualifications. ABB, including Maths and either Physics, Chemistry or Electronics + B in a relevant EPQ; ABB, including Maths and either Physics, Chemistry or Electronics + B in AS Level or A Level Further Maths*

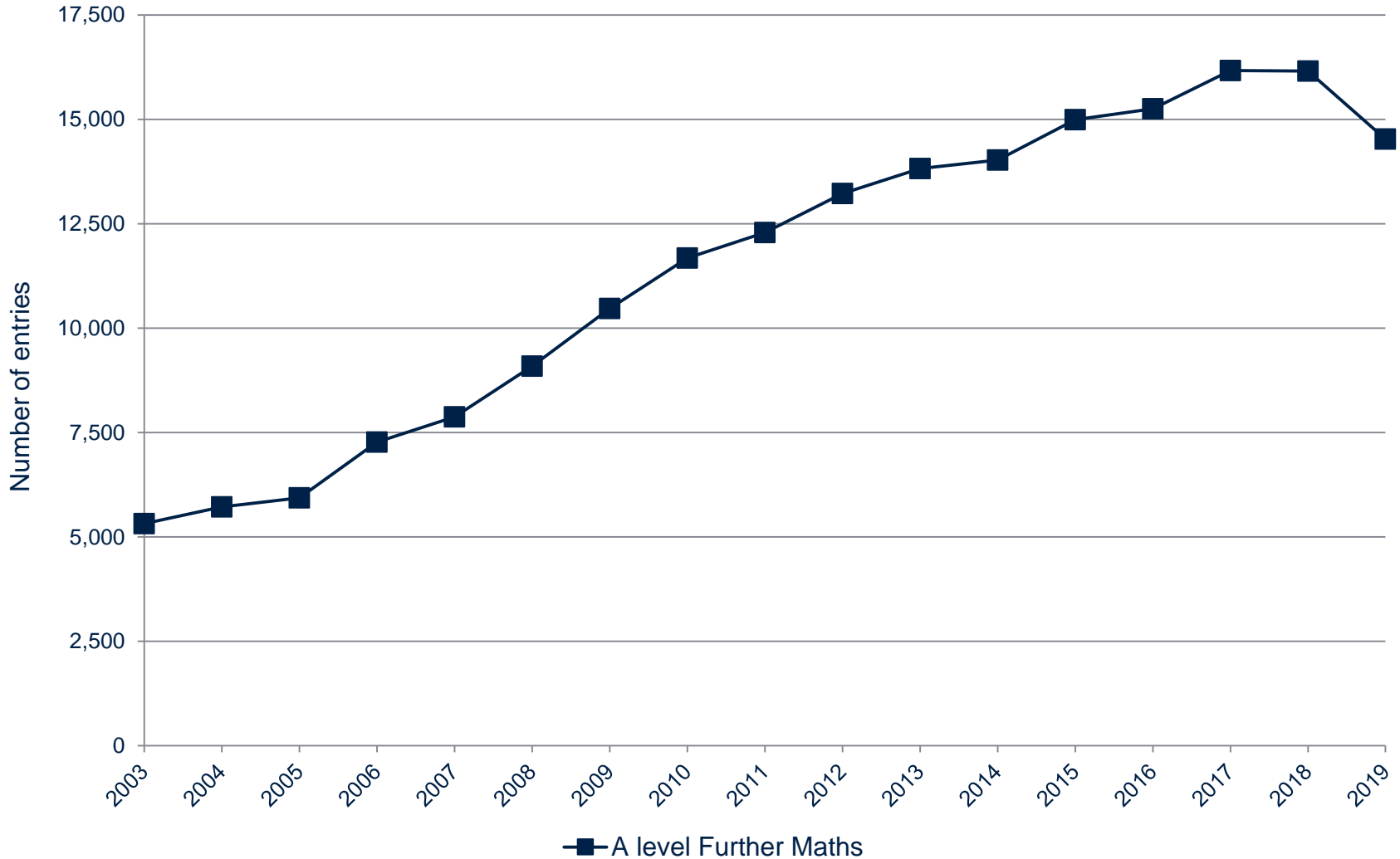
Electronic Engineering, University of Sheffield

Qualifications on entry to university

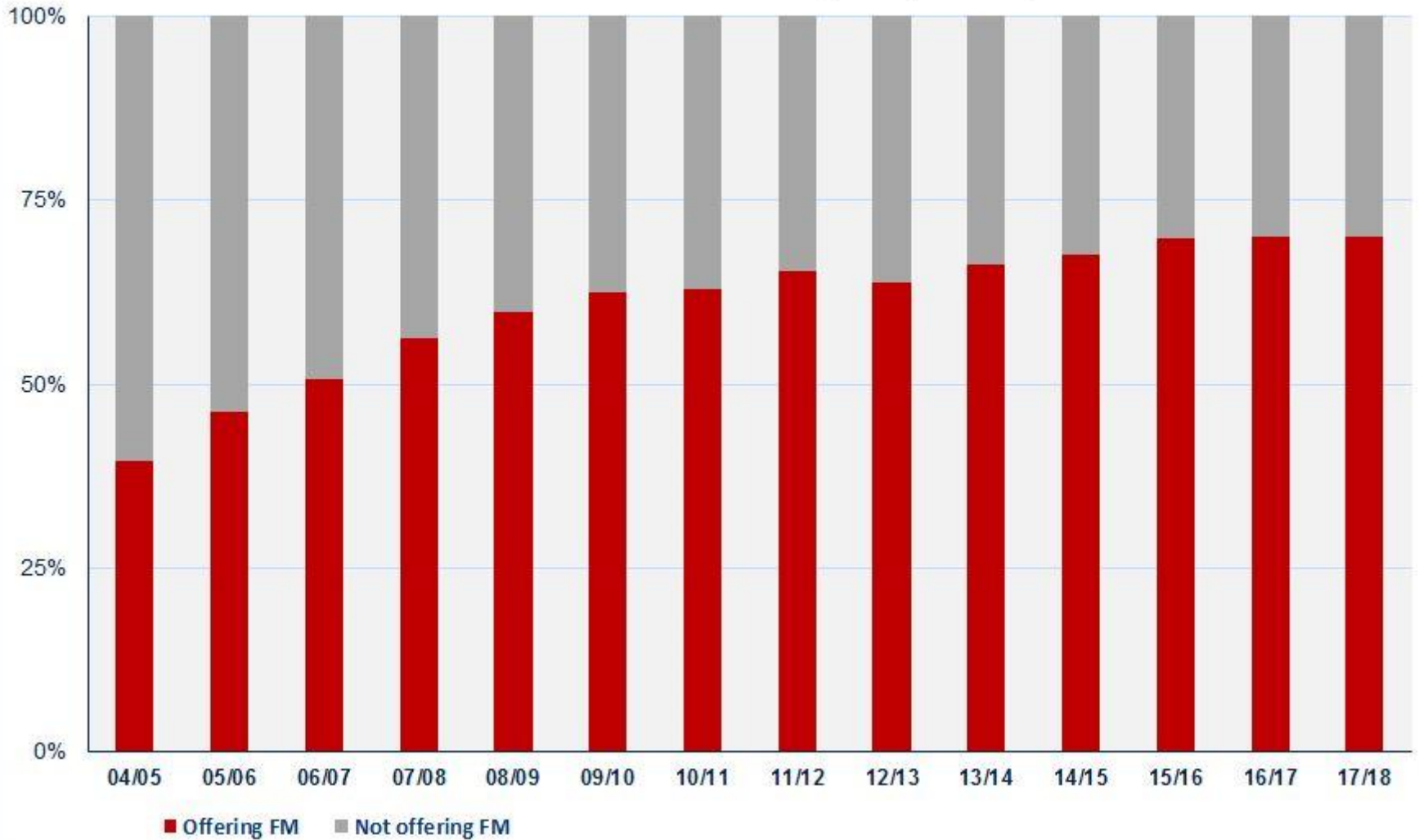
Year	Total number of students accepted to G1 Mathematics courses			% accepted to G1 Mathematics with A-levels that had A-level FM
	All	studied A-levels	studied A-level FM	
2005–06	5041	4217	1503	35.6%
2006–07	5349	4465	1756	39.3%
2007–08	5861	4799	1935	40.3%
2008–09	6403	5591	2250	40.2%
2009–10	6916	6096	2454	40.3%
2010–11	7276	6651	2855	42.9%
2011–12	7585	6429	3055	47.5%
2012–13	7311	6002	3006	50.1%
2013–14	7699	6427	3832	59.6%

JACS Subject Classification		% accepted with A levels that had studied A Level (A2) Further Mathematics	
		2005-06	2013-14
H1	General Engineering	8.8	25.9
H2	Civil Engineering	8.1	18.7
H3	Mechanical Engineering	11.1	22.5
H4	Aerospace Engineering	13.7	23.4
H6	Electronic and Electrical Engineering	10.8	22.6
H8	Chemical Process and Energy Engineering	8.7	19.9
HH	Combinations with Engineering	6.6	23.7

A level Further Mathematics entries in the UK 2003-2019 (JCQ data)



**State-funded institutions offering A level Mathematics that also offer
A level Further Mathematics in England (Source: DfE)**



Final Thoughts

- The content of FM is good preparation for a number of STEM degrees;
- Some courses require FM, some will make a differentiated offer based upon FM;
- AS FM is still a very valuable qualification as preparation for a range of degree courses;
- The proportion of students on STEM degrees with FM has been rising;
- Why not take FM?