Physics Degrees

A level Mathematics and Further Mathematics

All Physics degree courses require A level Mathematics (or an equivalent qualification) for entry. Some courses prefer students to have studied more mechanics as part of their A level Mathematics.

Studying A level or AS level Further Mathematics is excellent preparation for a Physics degree as it not only provides more opportunity to study mechanics but also introduces new topics that you will find useful if you intend to study Physics, such as complex numbers, matrices, differential equations and vectors.

Some Physics degree courses specifically mention Further Mathematics in their entry requirements, encouraging students to take Further Mathematics if possible. Increasing numbers of students starting physics degrees have studied either AS or A level Further Mathematics in addition to A level Mathematics.

Overview of Mathematics covered in Physics Degrees

Whilst the first year mathematical content may vary from university to university, there are many topics that are common to all Physics courses:

- Calculus and Differential Equations
- Series expansions and limits
- Complex numbers
- Functions - Exponential, Logarithmic,Trigonometric and Hyperbolic
- Matrices, eigenvalues and eigenvectors
- Vectors
- Mechanics Topics - circular motion, simple harmonic motion, rigid bodies
- Probability distributions
- Mathematical Modelling

The table below shows typical areas of A level Mathematics and Further Mathematics that you will encounter in a Physics degree course. The topics in red are included as additional resources in this folder on Integral and give examples of how mathematics might be applied in a Physics degree.

Calculus	Differential Equations	Complex Numbers	Functions
Differentiation – implicit and parametric Integration methods - by parts, substitution, separation of variables	Linear First Order ODEs Linear Second Order ODEs Particular solutions	Cartesian, Polar & Exponential Forms Euler's formula De Moivre's theorem	Inverse Functions Trigonometric Exponential

			Logarithmic
Volume of revolution, centroids	**Motion of a coupled spring system**	Complex roots	Hyperbolic
Numerical methods		**Analysing AC current**	Curve Sketching
Series expansions and limits			
Partial differentiation			
Calculating Energy of an Oscillating Body			
Matrices	**Vectors**	**Mechanics**	**Probability**
Inverse of a matrix	Vector Algebra	Newton's laws of motion	Random variables
Product	Scalar and vector products	Conservation laws	Binomial distribution
Solution of sets of linear equations	Triple product	Collisions	Poisson distribution
Eigenvalues and eigenvectors	Differentiation and integration of vectors	Circular motion	
Matrices as transformations	Vector equations of lines and planes	Rigid body mechanics	
Calculating the current in a mesh		Moments of inertia, rotation	
		Simple harmonic motion, damping, resonance	

Example Careers

Here are links to two profiles of physics graduates with very different careers.

Lucie - a research fellow in solar physics describes her work and the path to her career on the **Futuremorph** science careers website.

Harjinder - a solicitor who makes use of his physics degree to understand the technological aspects of contracts.

Useful links

The following websites and books have useful information about the mathematical topics you will study during your Physics degree together with other resources to support your preparation for Physics at university:

PhysNRICH - a section of the Nrich website with problems and articles specific to applications of Mathematics in Physics. It is for students aged 14 - 19 and is designed to complement and enhance the study of physics. Some of the examples in the table above are from this website.

Isaac Physics - a bank of challenging questions for improving your mathematical problem solving skills for physics problems. The site includes notes and explanations of techniques and is designed and maintained by the University of Cambridge.

Physics.org Careers - the careers sections of the Institute of Physics website has profiles of physics graduates follow a wide range of careers.

The Maths Centre - this site was developed by a group from the Universities of Loughborough, Leeds and Coventry and has been set up to deliver mathematics support to students looking for post-16 mathematics help.