Mathematics and physics are a great combination to study at university, and provide the basis for a stimulating and enjoyable education.

Mathematics and physics are complementary subjects. Often, a way of thinking developed in one discipline leads to new insights into the other. The advances in the mathematical theory of dynamical systems and chaos are an example. Ideas from the theory are now applied in the modelling of physical systems such as the atmosphere, lasers and other complex systems.

In both subjects the emphasis is on learning how to recognise the surprising and how to reason. So, although the joint degree is the natural route into theoretical physics, the skills it teaches are universal and can lead to many different careers. Our former students have gone on to work in industry and in professions such as business, journalism and the financial sector.

There are two variants of the degree course: the three-year BSc and the four-year MMathPhys. You need to decide by the end of your second year which degree to aim for. BSc courses should be seen as part of a general rounded education, which should leave you numerate, articulate and employable. The four-year course should appeal most to you, if you intend to make direct use of your knowledge of mathematics and physics after you graduate.

Danny Steeghs
Head, Undergraduate Admissions
THE WARWICK DEGREE

GF13 BSc
FG31 MMathsPhys

The Warwick joint degree course is among the best established in the country and the course includes a number of modules from both contributing departments designed specifically for joint degree students. Each year around 65 students start on this course.

In the first year you take essential (core) modules in both mathematics and physics. You also take at least one additional module chosen from a list of options. At the end of the first year it is possible to change to either of the single honours courses, providing you satisfy certain requirements in the end of year examinations.

In the second and third years, there is considerable freedom to choose modules. By then you will have a good idea of your main interests and be well placed to decide which areas of mathematics and physics to study in greater depth. In effect you design your own degree. Some modules may also be taken from outside of both mathematics and physics.

We encourage you not only to consider the ‘obvious’ outside modules in computing or statistics, but also modules introducing secondary school teaching or a modern language.

The optional fourth year continues to cover the main areas of mathematics and physics. You can continue to study a broad spectrum of topics within both subjects. However you may choose to concentrate on one or two areas. This can give time to take in and reflect on some of the recent developments in these areas.

Our research is strong in a number of branches of mathematics and physics, and we are well placed to offer authoritative and coherent accounts of those recent developments likely to be of most interest to you as a joint degree student.
The first year is currently:

**Maths**
Mathematical Analysis (60 Lectures (L)), Sets and Numbers (30L), Linear Algebra (30L), Differential Equations (30L).

**Physics**
Physics Foundations (30L), Electricity and Magnetism (30L), Classical Mechanics and Relativity (30L), Quantum Phenomena (15L). There is also a Computing Workshop.

You choose at least one further module from:

**Options**
Abstract Algebra (15L), Astronomy (15L), Geometry (15L), Particle Physics (15L), Probability (30L), Programming for Scientists (30L).

Mathematics at university emphasises the importance of proof. All sciences test the validity of ideas and conjectures, usually by comparing with reality as seen in experiment. In mathematics, there are no experiments, so it is important to be able to construct watertight arguments or proofs.

Mathematics is also concerned with the generality of results. The process of figuring out the most general form of some result from an initial example is an important and rewarding part of the subject. It is often what suggests new results and can reveal connections with other areas within mathematics.

The central theme in physics is to identify the (relatively few) fundamental laws and show how they may be invoked to explain many natural phenomena. A good example is provided by Electricity and Magnetism, which were shown by Faraday, Maxwell and others to be manifestations of the same phenomenon - now called electromagnetism. As well as providing an introduction to astronomy, the module on Astronomy also illustrates this theme. Phenomena observed in the sun and planets are governed by the laws of mechanics and are usually closely related to phenomena, which are familiar from the terrestrial environment.

Most of the first year physics modules deal with familiar subjects, such as Newtonian mechanics and thermodynamics. The possible exceptions are the material on relativity and the module Quantum Phenomena. These deal with the breakdown of Newtonian physics at velocities close to the speed of light and at atomic length scales.

Computers are increasingly important in all of mathematics and theoretical physics. The Programming Workshop teaches Python programming and how to solve numerically the mathematical models of physical systems. In addition, you can opt to take the module Programming for Scientists. This is a Java-based module, which teaches object-oriented programming and algorithms. (The module assumes no prior knowledge of programming.)
TIMETABLE

The timetable for the first five weeks of the current first year (shown below) should give an idea of the typical weekly workload of lectures and tutorials.

The tutorials involve smaller groups and a lecturer or postgraduate student. The idea is to work through examples sheets handed out in the lectures and to discuss any problems with the material. Wednesday afternoons are kept free of classes, as Wednesday is the main day for university activities such as sport, drama and music.

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SECOND Year

In the second year there are core modules taken by everybody.

These core modules complete the basic material assumed by other modules. There is then a broad range of optional modules covering all the main areas of mathematics and physics.

Currently the core modules are:

**Maths**
Analysis III, Methods of Mathematical Physics, Multivariable Calculus, Partial Differential Equations, Variational Principles.

**Physics**
Electromagnetic Theory and Optics, Physics of Fluids, Quantum Mechanics and its Applications, Thermal Physics II.

Analysis III and Multivariable Calculus extend ideas learnt in the first year and introduce the analysis of functions of more than one variable and of complex variables. The module, Variational Principles, is concerned with a surprising and useful connection between functions, which minimise the values of certain integrals, and many problems from physics.

The field of fluids is one of the richest in applied mathematics and physics. Although motions of fluids - water and air are two we meet every day - are complicated, many flow patterns have simple and intuitively appealing explanations. You will learn, for example, why power lines whistle in the wind and why aeroplanes use their engines just before landing.

You choose about eight further modules (not all modules are the same length and may change over time) from:

**Maths**

**Physics**

**Outside Options**
Interdisciplinary modules like The Challenge of Climate Change, and modules from WBS (Warwick Business School), the Language Centre (Arabic, Chinese, French, German, Japanese, Portuguese, Russian and Spanish), and the Centre for Education Studies (Introduction to Secondary School Teaching).
THIRD Year BSc

In the third year of the BSc you take a module on Communicating Science. You select modules from the lists of options, which currently are:

Maths
Complex Analysis, Continuum Mechanics, Control Theory, Fluid Dynamics, Functional Analysis, Geometry of Curves and Surfaces, Group Theory, History of Mathematics, Measure Theory, Qualitative Theory of ODEs, Theory of PDEs, Topics in Mathematical Biology.

Physics

Outside Options
Modules from WBS, the Language Centre, the Mathematics, and other, departments.

You can choose to carry out a research-style project worth 30% of the year’s credit.

You choose a title from a list of titles suggested by supervising members of staff. A project brings you into contact with a research group, where you work with and alongside postgraduate students and research fellows. It can give fresh insight into the way research scientists work and think.
THIRD Year MMathPhys

Opting for the MMathPhys allows you more time to explore the implications of what you have already learnt.

The third year, like the second year, consists of compulsory modules covering the material which will be assumed by many of the fourth year modules, and modules chosen from lists of options. The core modules are:

**Physics**
Quantum Physics of Atoms, Kinetic Theory, Electrodynamics.

**Mathematics**
Fluid Dynamics.

There is a Laboratory and Skills module. As a member of a group of three students, you complete an experiment and a computer-based simulation of a physical system. You present your results both orally and in an extended written report.

Typically, you take a further six modules from the options listed for the third year of the BSc.

“The overlap – using cool maths to explain the phenomena we see around us – is what I am particularly interested in. I don’t just want to be told the answers though; being able to learn more deeply, and fully understand these problems is much more important to me. It has enabled me to develop so many useful skills, alongside learning more about my subjects.”

**Beth Kynman**
3rd Year MMathPhys
Mathematics and Physics
FOURTH Year

During the fourth year you join one of the research groups and work as a member of a pair on a research-style project.

The project work gives you experience of working more independently. This experience should be valuable to you in your subsequent career, whether you choose to work as a scientist or not, and can help you when you are making decisions about possible careers.

You also take between six and twelve of the following modules (not all modules are the same length) choosing at least two from the list of physics modules and two from the list of mathematics modules. The lists are currently:

**Mathematics**
Advanced Partial Differential Equations, Dynamical Systems, Fourier Analysis, Functional Analysis, Quantum Mechanics: Basic Principles and Probabilistic Methods, Statistical Mechanics. Modules from the third year lists can also be chosen.

**Physics**
Advanced Particle Physics, Condensed Matter Physics II, Functional Properties of Materials, Gauge Theories of Particle Physics, General Relativity, High Energy Astrophysics, High Performance Computing in Physics, Neutrino Physics, Planets Exo-Planets and Life, Quantum Theory of Interacting Particles, Relativistic Quantum Mechanics, Solar Magnetohydrodynamics, Structure and Dynamics of Solids. You may also take modules from the third year, which you have not already taken.

**Outside Options**
There is no formal list of outside options. However, you can follow modules from outside the department provided that the timetable permits this.

INTERCALATED Year

You may also extend the BSc degree by inserting an extra year (usually) between your second and what would otherwise be your third year.

You would spend this ‘intercalated’ year studying at a foreign university or working in a research laboratory.
FIND OUT MORE

HOW TO APPLY
Applications are made through UCAS ucas.com

We do not typically interview applicants. Offers are made based on your predicted and actual grades, along with your personal statement. Occasionally, some applicants may be interviewed, for example candidates returning to study or those with non-standard qualifications. After completing your application through UCAS and being made an offer you will be invited to an offer holder day. warwick.ac.uk/study/undergraduate/apply

OFFER HOLDER DAYS
A perfect opportunity to visit our campus and experience what it is like to be a student at Warwick. warwick.ac.uk/opendays

STUDENT FEES AND FUNDING
We want to ensure that, wherever possible, financial circumstances do not become a barrier to studying at Warwick. We provide extra financial support for qualifying students from lower income families. warwick.ac.uk/study/undergraduate/studentfunding

ACCOMMODATION
Warwick Accommodation has over 6,000 rooms across a range of well-managed self-catering residences. There is an excellent network of support staff in the Residential Life Team. warwick.ac.uk/accommodation

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This course information was accurate at the time of printing. Our course and module content and schedule is continually reviewed and updated to reflect the latest research expertise at Warwick, so it is therefore very important that you check the website for the latest information before you apply and when you accept an offer.