Physics Courses
Physics at Warwick
Physics Courses
Introduction

“The physics course is designed as a broad and flexible education. We offer the modules you would need to move on to further training in physics. At the same time, if you want a broader education, the flexibility of the course allows you to combine the physics modules which interest you most, with modules from other disciplines.

Studying for a physics degree gives benefits which last a lifetime, as well as knowledge and skills which are valued by employers generally. Some of these benefits are less tangible than others, such as the pleasure that can come from being able to read about and understand the latest discoveries in science, while others are more specific. Where these skills are useful in many contexts, they are called generic skills. They include, for example, a practical approach to problem solving, and the ability to reason clearly and to communicate well.

There are two variants of the degree course: the three-year BSc and the four-year MPhys. BSc courses within the UK and across Europe are being seen increasingly 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 physics after you graduate.”

Danny Steeghs
Head, Undergraduate Admissions
In the first year, you take essential (core) modules and choose at least one more module from a list of options. 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 to study in greater depth. In effect you design your own degree.

The option scheme also allows a proportion of modules to be taken from outside of physics. We encourage you not only to consider obvious outside modules, for example in mathematics, but also modules introducing secondary school teaching, business studies, or a modern language.

The fourth year includes modules on all the main areas of physics. It will encourage you to reflect more on some of the unsolved problems in physics than is possible in the first three years.

We have research strengths in a number of branches of physics, and can offer authoritative and coherent accounts of those recent developments likely to be of most interest to you. In the third and fourth years, you will benefit from interacting with our research groups when you undertake research-style projects.
The First Year

In the first year you take the following modules:

Core
Mathematics for Physicists (60L), Classical Mechanics and Relativity (30L), Physics Foundations (30L), Electricity and Magnetism (30L), Programming Workshop (15L), Quantum Phenomena (15L).

There is a key skills module, which everybody takes. This involves working in the teaching laboratory, as well as computing and presentation work.

Options
You also choose at least one of: Astronomy (15L), Particle Physics (15L).

Physics involves observing nature and identifying the universal laws, which govern its behaviour. The module on Classical Mechanics illustrates this well. The laws of mechanics were deduced by Newton after studying observations of planetary motion. They apply to nearly all systems familiar from everyday life as well as many of the phenomena observed in stars and the other planets, some of which are also discussed in the module on Astronomy.

The modules Classical Mechanics and Relativity, and Quantum Phenomena, deal with the breakdown of Newtonian mechanics at speeds close to the speed of light and at short (atomic) distances. Other first year physics modules treat material, which should in part be familiar from A level (electricity, magnetism and heat), but are able to illustrate it with more interesting examples and to bring out better the unifying concepts.

Measurement is central to physics and nearly all discoveries involve experiment. Time spent in the teaching laboratory helps you to develop the skills needed for measurement and the reliable interpretation of data.

You may also take other modules taught within the university under our ‘unusual option’ scheme. We encourage you to explore outside the field of physics. As well as exposing you to alternative ways of thinking, outside modules can help set physics into the context of science as a whole.

To give an impression of the weekly workload of lectures and tutorials, please see below a typical timetable for the first five weeks of the first year.
The tutorials involve smaller groups working with 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 teaching as this is the main day for university activities such as sport, drama and music.

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### Timetable

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<td>09:05-09:55</td>
<td>Maths for Physicists</td>
<td>Maths for Physicists</td>
<td>Classical Mechanics and Relativity</td>
<td>Maths for Physicists</td>
<td>Maths Tutorial</td>
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<td>10:05-10:55</td>
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<td>Physics Foundations</td>
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<td>Physics Examples</td>
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<td>11:05-11:55</td>
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<td>Tutorial</td>
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### First Year timetable (weeks 1-5): afternoons

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<td>Classical Mechanics and Relativity</td>
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The Second Year

In the second year everybody takes the following modules:

Core
Electromagnetic Theory and Optics, Mathematical Methods for Physics, Quantum Mechanics and its Applications, Thermal Physics II.

You continue to work in the laboratory as part of the Physics Skills Programme. You also complete library research, data analysis and writing exercises.

You choose about a further six modules (not all modules are the same length) from:

Physics
Climate Change, Computational Physics, Experimental Particle Physics, Geophysics, Hamiltonian Mechanics, Physics of Electrical Power Generation, Physics of Fluids, Stars.

Outside Options
Examples include 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).
The project brings you into contact with a research group where you work alongside research students, technicians and research fellows. The project can give you insights into how research scientists work and think.

You also take the module Quantum Physics of Atoms, and around twelve modules selected from the lists shown below, where we have grouped the physics modules together according to subject matter. Although there is no formal requirement to select a set number of modules from any one list, it is usually better to concentrate on two or three areas.

**Astrophysics**
Astrophysics, Cosmology, Galaxies.

**Classical Physics**

**Quantum Phenomena**
Condensed Matter Physics, Nuclear Physics, The Standard Model.

**Interdisciplinary**

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

If you are on the three-year BSc course, you will work in a pair on a project chosen from a list of titles suggested by your supervising members of staff.
The Group Project and the laboratory are designed to give experience of those working methods, which cannot easily be taught in lecture halls. For the Group Project, you work in groups of five or six to study an area of physics and write a review of the current status of the area.

In the laboratory, you complete some longer and more involved experiments than are possible in the first and second year teaching laboratories.

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

Core

Quantum Physics of Atoms, Electrodynamics, Mathematical Methods III.

You take further modules from the options listed for the third year of the BSc but must choose at least two of Galaxies, Condensed Matter Physics, The Standard Model and Plasma Electrodynamics.
The Fourth Year

During the fourth year, you join one of the research groups in the department (experimental or theoretical) and work in pairs on a research project.

The project work gives experience of working more independently. This experience should be valuable in your future career, whether you work as a scientists or not, and can help you make more informed career choices.

You will also take around twelve (not all modules are the same length) of the following modules with at least eight chosen from the list of physics modules:

**Astrophysics**
The Distant Universe, Exo-Planets, High Energy Astrophysics.

**Classical Physics**

**Computing**
High Performance Computing in Physics.

**Condensed Matter**

**Quantum Theory**
Gauge Theories for Particle Physics, Relativistic Quantum Mechanics, Quantum Theory of Interacting Particles.

**Elementary Particle Physics**
Advanced Particle Physics, Gauge Theories for Particle Physics, Neutrino Physics.

**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. During this ‘intercalated’ year, you would study at a foreign university or laboratory.
The departments at Warwick have a tradition of offering as many of their modules as possible to students from other disciplines. However, for those with a particular interest in Business Studies there is the Physics and Business Studies degree.

The course is designed for students who enjoy physics but wish also to develop an interest in management and business. The Warwick Business School, which is a leading Business School in the country, has pioneered the teaching of management science to undergraduates at British universities.

During the first two years of the degree, you are based in the Department of Physics. You take the core physics modules and an introductory module on business. You would normally take more outside modules including perhaps a foreign language module.

In the third year you transfer to WBS (Warwick Business School), where you choose four modules from the lists of those available. Each module lasts the whole year and carries 25% of the final year credit.
If you have any questions or need further information after reading this guide, please contact:

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