

PROGRAMME SPECIFICATION

This document describes **BSc Honours Degree programmes in Physics**. For Combined and Joint Honours Degree programmes, please also refer to the equivalent document(s) for the other subject(s). This specification is valid for entrants from **September 2016**.

The aims of all Honours Degree programmes in Physics are:

- to impart a secure knowledge of the fundamental elements of Physics;
- to nurture confidence in the use of appropriate mathematical techniques;
- to develop the skills and knowledge required for experimentation and/or theoretical modelling;
- to promote oral and written communication skills;
- to teach the effective use of information technology and computing facilities for the treatment and presentation of experimental data;
- to provide a sound awareness of safety procedures and environmental issues;
- to develop and strengthen problem solving abilities;
- to provide a firm foundation for postgraduate research and further study in the physical sciences or for entry into a wide range of both scientific and non-vocational careers.

Programmes are delivered in three stages, each of which comprises one year of full-time study during which the student must follow courses to the value of 120 credits. For some programmes there is the option of part-time study. In that case a stage may be spread over two years of study; in each part-time year the student will follow courses to the value of 60 credits. The curriculum is characterised by strong progression and opportunities for specialisation throughout the programme. Stages one and two provide a foundation for the later stages through a compulsory spine of courses that complete a core, discipline-specific, knowledge base. Stage three offers a wide range of optional courses for Single Honours students; for those taking Joint or Combined Honours, the compulsory spine extends into this stage.

Specifically, stage one gives a balanced foundation for progression, offers opportunities for students to select and move between degree programmes according to their interests and provides a foundation which serves students from a wide variety of educational backgrounds. The stage one curriculum aims:

1. to extend and develop classical physics covered at A-level, to bring students to a common level and to set their knowledge into an appropriate context;
2. to develop modern physics and establish it on a firm foundation, enabling students to experience the flavour of modern physics, without excessive technical detail;
3. to extend and develop the mathematics covered at A-level;
4. to start the programme of discipline-specific and transferable skills.

Stage two builds on this and applies the skills and knowledge acquired to specific subjects. The available courses complete the essential physics core consisting of classical and modern physics, emphasising Electromagnetism, Quantum Mechanics, and Classical and Statistical Thermodynamics. Skills are further developed and Physics specialists take courses in Mathematical Methods, Solid State Physics, Optics, and Atomic and Nuclear Physics. Other courses are available for the other programmes.

In stage three, students take a number of advanced courses including options depending on their degree programme and personal interests. An important component of the final year is a project, PH3110, which may be of an experimental, theoretical, computational or electronics nature. Some third year courses closely reflect the research interests of members of staff, who are active specialists in their fields.

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This document provides a summary of the main features of the programme(s), and of the outcomes which a student might reasonably be expected to achieve if full advantage is taken of the learning opportunities provided. Further information is contained in the College prospectus, the College Regulations and in various handbooks issued to students upon arrival. Whilst Royal Holloway keeps all its information for prospective applicants and students under review, programmes and the availability of individual courses are necessarily subject to change at any time, and prospective applicants are therefore advised to seek confirmation of any factors which might affect their decision to follow a specific programme. In turn, Royal Holloway will inform applicants and students as soon as is practicable of any substantial changes which might affect their studies.

Learning outcomes

Teaching and learning in the programmes are closely informed by the active research of staff. In general terms, the programmes provide opportunities for students to develop and demonstrate the following learning outcomes:

Knowledge and understanding

- a broad knowledge of the inanimate physical universe to a level appropriate for a Bachelor's degree;
- a sound knowledge of the fundamental concepts of Physics and how these may be applied to understand complex physical systems and address associated problems;
- an understanding of the quantum and continuum descriptions of natural phenomena;
- an appreciation of the microscopic and macroscopic structure of all the states (phases) of matter and their interactions with different forms of energy;
- a knowledge and understanding of important physical laws and principles, and competence in the application of these principles to more diverse areas of physics and, where appropriate, to other disciplines;
- a secure understanding of the experimental and/or theoretical techniques and diagnostic tools appropriate to the particular field of endeavour and an awareness of such techniques in other fields;
- a critical approach to the gathering, collating, analysis and reporting of experimental data based on an understanding of errors and the limits of measurement;
- an understanding of mathematical modelling and of the role of approximation.

Skills and other attributes

- use appropriate mathematical and/or computational tools to formulate and tackle problems in physics and to model physical behaviour, making necessary approximations, thus comparing critically the results of calculations with those from experimental observation;
- use appropriate methods to analyse data and to evaluate the level of its uncertainty and to relate any conclusions to current theories of the physics involved;
- execute an experiment or investigation, analyse critically the results of it and draw valid conclusions including evaluation of the level of uncertainty in the results and comparison with expected outcomes, published results or theoretical predictions;
- plan, execute and report the results of an experiment or investigation in physics;
- communicate scientific information clearly and accurately with correct use of technical language;*
- use a range of laboratory apparatus competently and safely;

- read demanding textbooks, and other available literature, search databases and listen carefully and interact with colleagues to extract important information. Make use of appropriate IT packages/systems for the retrieval and analysis of this data;*
- manipulate numerical data, and present and interpret information graphically;*
- analyse complex information, manipulating precise and intricate ideas to construct logical arguments and then presenting them in a clear and concise manner.*

* transferable skills

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Teaching, learning and assessment

Teaching is mostly by means of lectures, seminars, laboratory practical classes and problem-solving sessions; the latter generally providing a forum for students, with the support of their instructors, to work through problem sets and applications in a smaller and more interactive setting. Learning is through participation in lectures and seminars, designated reading, completion of problem sets and guided independent study and research. All students are expected to meet basic standards in information technology, for which training is provided by the College Computer Centre. Assessment of knowledge and understanding is mainly by formal, unseen written examination; coursework exercises, laboratory reports, oral and poster presentations and a Project dissertation are also assessed. A detailed mapping of the ways in which particular courses and modules achieve the programmes' learning outcomes may be found in the [Department of Physics](#) Student Handbook. Full details of the assessments for individual courses can be obtained from the [Department](#).

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Details of the programme structure(s)

Please note that not all courses run each year. A full list of courses including optional courses for the current academic year can be obtained from the [Department](#).

A summary is provided in the tables below. The entries indicate:

Mandatory non -conดอนable - courses which must be taken and passed in order to progress to the next stage;

Mandatory condonable – courses which must be taken at the designated stage of the programme;

Option - option courses may be chosen, with guidance, by students.

Single Honours Degree programmes and Combined Honours programmes taught wholly within Physics

Stage one

Students must take the following **mandatory** courses:

PH1110 Mathematics for Scientists 1 (15 credits) non-conดอนable

PH1120 Mathematics for Scientists 2 (15 credits) non-conดอนable

PH1140 Scientific Skills 1 (15 credits) condonable

PH1150 Scientific Skills 2 (15 credits) condonable

PH1320 Classical Mechanics (15 credits) condonable

PH1420 Fields and Waves (15 credits) condonable

PH1620 Classical Matter (15 credits) condonable

PH1920 Physics of the Universe (15 credits) condonable

Stage two

Students registered on **F300** must take the following **mandatory** courses:

PH2130 Mathematical Methods (15 credits) condonable

PH2150 Scientific Computing Skills (15 credits) condonable

PH2210 Quantum Mechanics (15 credits) condonable

PH2310 Optics (15 credits) condonable

PH2420 Electromagnetism (15 credits) condonable

PH2510 Atomic and Nuclear Physics (15 credits) condonable
PH2610 Classical and Statistical Thermodynamics (15 credits) condonable
PH2710 The Solid State (15 credits) condonable

Students registered on **F340** must take the following **mandatory** courses:

PH2130 Mathematical Methods (15 credits) condonable
PH2150 Scientific Computing Skills (15 credits) condonable
PH2210 Quantum Mechanics (15 credits) condonable
PH2310 Optics (15 credits) condonable
PH2420 Electromagnetism (15 credits) condonable
PH2510 Atomic and Nuclear Physics (15 credits) condonable
PH2610 Classical and Statistical Thermodynamics (15 credits) condonable
PH2710 The Solid State (15 credits) condonable

Students registered on **F511** must take the following mandatory courses:

PH2130 Mathematical Methods (15 credits) condonable
PH2150 Scientific Computing Skills (15 credits) condonable
PH2210 Quantum Mechanics (15 credits) condonable
PH2310 Optics (15 credits) condonable
PH2420 Electromagnetism (15 credits) condonable
PH2510 Atomic and Nuclear Physics (15 credits) condonable
PH2610 Classical and Statistical Thermodynamics (15 credits) condonable
PH2900 Astronomy (15 credits) condonable

Students registered on **F370** must take the following **mandatory** courses:

PH2130 Mathematical Methods (15 credits) condonable
PH2150 Scientific Computing Skills (15 credits) condonable
PH2210 Quantum Mechanics (15 credits) condonable
PH2420 Electromagnetism (15 credits) condonable
PH2510 Atomic and Nuclear Physics (15 credits) condonable
PH2520 Particle Detectors and Accelerators (15 credits) condonable
PH2610 Classical and Statistical Thermodynamics (15 credits) condonable
PH2710 The Solid State (15 credits) condonable

Students registered on **F310** must take the following **mandatory** courses:

PH2130 Mathematical Methods (15 credits) condonable
PH2150 Scientific Computing Skills (15 credits) condonable
PH2210 Quantum Mechanics (15 credits) condonable
PH2310 Optics (15 credits) condonable
PH2420 Electromagnetism (15 credits) condonable
PH2510 Atomic and Nuclear Physics (15 credits) condonable
PH2610 Classical and Statistical Thermodynamics (15 credits) condonable
PH2710 The Solid State (15 credits) condonable

Stage three

Students registered on **F300** must take the following **mandatory** courses:

PH3110 Experimental or Theoretical project (15 credits) condonable
and choose seven courses from the options offered by the department.

Students registered on **F340** must take the following **mandatory** courses:

PH3110 Experimental or Theoretical project (15 credits) condonable
PH3130 Advanced Classical Physics (15 credits) condonable

PH3150 Further Mathematical Methods (15 credits) condonable
 PH3210 Quantum Theory (15 credits) condonable
 PH3910 General Relativity and Cosmology (15 credits) condonable
 and choose 3 courses from the options offered by the Department.

Students registered on **F511** must take the following **mandatory** courses:

PH3110 Experimental or Theoretical project (15 credits) condonable
 PH3210 Quantum Theory (15 credits) condonable
 PH3520 Particle Physics (15 credits) condonable
 PH3910 General Relativity and Cosmology (15 credits) condonable
 PH3920 Stellar Astrophysics (15 credits) condonable
 PH3930 Particle Astrophysics (15 credits) condonable
 PH2710 The Solid State (15 credits) condonable
 and choose 1 course from the options offered by the Department.

Students registered on **F370** must take the following **mandatory** courses:

PH3110 Experimental or Theoretical project (15 credits) condonable
 PH3210 Quantum Theory (15 credits) condonable
 PH3520 Particle Physics (15 credits) condonable
 PH3930 Particle Astrophysics (15 credits) condonable
 PH2310 Optics (15 credits) condonable
 and choose 3 courses from the options offered by the Department.

Students registered on **F310** must take the following **mandatory** courses:

PH3110 Experimental or Theoretical project (15 credits) condonable
 PH3710 Metals and Semiconductors (15 credits) condonable
 PH3730 Superconductivity & Magnetism (15 credits) condonable
 PH3810 Frontiers of Metrology (15 credits) condonable
 and choose 4 courses from the options offered by the Department.

Students take the following courses:			F300 Physics	F340 Theoretical Physics	F511 Astrophysics	F370 Physics with Particle Physics	F310 Experimental Physics
Stage 1							
Mathematics for Scientists 1	PH1110	15 credits	Mand Non-Cond	Mand Non-Cond	Mand Non-Cond	Mand Non-Cond	Mand Non-Cond
Mathematics for Scientists 2	PH1120	15 credits	Mand Non-Cond	Mand Non-Cond	Mand Non-Cond	Mand Non-Cond	Mand Non-Cond
Scientific Skills 1	PH1140	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Scientific Skills 2	PH1150	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Classical Mechanics	PH1320	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Fields and Waves	PH1420	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Classical Matter	PH1620	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond

Physics of the Universe	PH1920	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Stage 2							
Mathematical Methods	PH2130	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Scientific Computing Skills	PH2150	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Quantum Mechanics	PH2210	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Optics	PH2310	15 credits	Mand Cond	Mand Cond	Mand Cond		Mand Cond
Electromagnetism	PH2420	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Atomic and Nuclear Physics	PH2510	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Particle Detectors and Accelerators	PH2520	15 credits				Mand Cond	
Classical and Statistical Thermodynamics	PH2610	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
The Solid State	PH2710	15 credits	Mand Cond	Mand Cond		Mand Cond	Mand Cond
Astronomy	PH2900	15 credits			Mand Cond		
Physics options	x 15 credits		o	o	o	o	o
Stage 3							
Experimental or Theoretical Project	PH3110	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Energy	PH3040	15 credits	option	option	option	option	option
Advanced Classical Physics	PH3130	15 credits	option	Mand Cond	option	option	option
Further Mathematical Methods	PH3150	15 credits	option	Mand Cond	option	option	option
Nonlinear Systems and Chaos	PH3160	15 credits	option	option		option	option
C++ and Object Oriented Programming	PH3170	15 credits	option	option	option	option	option
Experimental Design	PH3180	15 credits	option	option	option	option	option
Quantum Theory	PH3210	15 credits	option	Mand Cond	Mand Cond	Mand Cond	option
Particle Physics	PH3520	15 credits	option	option	Mand Cond	Mand Cond	option
Metals and Semiconductors	PH3710	15 credits	option	option		option	Mand Cond
Superconductivity and Magnetism	PH3730	15 credits	option	option		option	Mand Cond
Frontiers of Metrology	PH3810	15 credits	option	option		option	Mand Cond
General Relativity and Cosmology	PH3910	15	option	Mand	Mand	option	

		credits		Cond	Cond		
Stellar Astrophysics	PH3920	15 credits	option	option	Mand Cond	option	option
Particle Astrophysics	PH3930	15 credits	option	option	Mand Cond	core	option
Planetary Geology and Geophysics	GL3510	15 credits	option	option	option	option	option
Optics	PH2310	15 credits				Mand Cond	
Particle Detectors and Accelerators	PH2520	15 credits	option	option			
The Solid State	PH2710	15 credits			Mand Cond		
Astronomy	PH2900	15 credits	option	option		option	
Physics options	x 15 credits		7	3	1	3	4
In choosing options you may take no more than a total of 2 level-2 courses in the third year.							
Options taken in the second year may not be taken again in the third year.							

Combined Honours programmes with Physics as the major element

Stage one

Students registered on **F3W3** must take the following **mandatory** courses:

PH1110 Mathematics for Scientists (15 credits) non-condonable

PH1120 Mathematics for Scientists 2 (15 credits) non-condonable

PH1140 Scientific Skills 1 (15 credits) condonable

PH1320 Classical Mechanics (15 credits) condonable

PH1420 Fields and Waves (15 credits) condonable

PH1620 Classical Matter (15 credits) condonable

PH1920 Physics of the Universe (15 credits) condonable

and 15 credits from the options offered by the Department of Music.

Students registered on **F3V5** must take the following **mandatory** courses:

PH1110 Mathematics for Scientists (15 credits) non-condonable

PH1120 Mathematics for Scientists 2 (15 credits) non-condonable

PH1140 Scientific Skills 1 (15 credits) condonable

PH1320 Classical Mechanics (15 credits) condonable

PH1620 Classical Matter (15 credits) condonable

PH1920 Physics of the Universe (15 credits) condonable

PY1101 Epistemology and Metaphysics (15 credits) non-condonable

and a 15 credit course from the options offered by the Department of Philosophy.

Stage two

Students registered on **F3W3** must take the following **mandatory** courses:

PH2130 Mathematical Methods (15 credits) condonable

PH2150 Scientific Computing Skills (15 credits) condonable

PH2210 Quantum Mechanics (15 credits) condonable

PH2510 Atomic and Nuclear Physics (15 credits) condonable

PH2610 Classical and Statistical Thermodynamics (15 credits) condonable

PH2710 The Solid State (15 credits) condonable

and choose 30 credits from the options offered by the Department of Music.

Students registered on **F3V5** must take the following **mandatory** courses:

- PH2130 Mathematical Methods (15 credits) condonable
- PH2150 Scientific Computing Skills (15 credits) condonable
- PH2210 Quantum Mechanics (15 credits) condonable
- PH2610 Classical and Statistical Thermodynamics (15 credits) condonable
- PH2710 The Solid State (15 credits) condonable
- PH1420 Fields and Waves (15 credits) condonable
- PY2001 Kant to Hegel (15 credits) condonable
- PY2002 Mind and World (15 credits) condonable

Stage three

Students registered on **F3W3** must take the following **mandatory** courses:

- PH3110 Experimental or Theoretical Project (15 credits) condonable
- PH2310 Optics (15 credits) condonable
- PH2420 Electromagnetism (15 credits) condonable
- 30 credits of third year options offered by Physics
- and choose 45 credits from the third year options offered by the Department of Music.

Students registered on **F3V5** must take the following **mandatory** courses:

- PH3110 Experimental or Theoretical Project (15 credits) condonable
- PH3420 Electromagnetic Theory (15 credits) condonable
- PH2310 Optics (15 credits) condonable
- PH2510 Atomic and Nuclear Physics (15 credits) condonable
- 30 credits of third year options offered by Physics
- and choose 30 credits from the options offered by the Department of Philosophy.

			F3W3 Physics with Music	F3V5 Physics with Philosophy
Students take the following courses:				
Stage 1				
Mathematics for Scientists 1	PH1110	15 credits	Mand Non-Cond	Mand Non-Cond
Mathematics for Scientists 2	PH1120	15 credits	Mand Non-Cond	Mand Non-Cond
Scientific Skills 1	PH1140	15 credits	Mand Cond	Mand Cond
Classical Mechanics	PH1320	15 credits	Mand Cond	Mand Cond
Fields and Waves	PH1420	15 credits	Mand Cond	
Classical Matter	PH1620	15 credits	Mand Cond	Mand Cond
Physics of the Universe	PH1920	15 credits	Mand Cond	Mand Cond
Epistemology and Metaphysics	PY1101	15 credits		Mand Non-Cond
<i>Minor options</i>	x 15 credits		1	1

Stage 2				
Mathematical Methods	PH2130	15 credits	Mand Cond	Mand Cond
Scientific Computing Skills	PH2150	15 credits	Mand Cond	Mand Cond
Quantum Mechanics	PH2210	15 credits	Mand Cond	Mand Cond
Atomic and Nuclear Physics	PH2510	15 credits	Mand Cond	
Classical and Statistical Thermodynamics	PH2610	15 credits	Mand Cond	Mand Cond
The Solid State	PH2710	15 credits	Mand Cond	Mand Cond
Fields and Waves	PH1420	15 credits		Mand Cond
Kant to Hegel	PY2001	15 credits		Mand Cond
Mind and World	PY2002	15 credits		Mand Cond
<i>Minor options</i>	x 15 credits		2	0
Stage 3				
Experimental or Theoretical Project	PH3110	15 credits	Mand Cond	Mand Cond
Energy	PH3040	15 credits	option	option
Advanced Classical Physics	PH3130	15 credits	option	option
Further Mathematical Methods	PH3150	15 credits	option	option
Nonlinear Systems and Chaos	PH3160	15 credits	option	option
C++ and Object Oriented Programming	PH3170	15 credits	option	option
Experimental Design	PH3180	15 credits	option	option
Quantum Theory	PH3210	15 credits	option	option
Electromagnetic Theory	PH3420	15 credits		Mand Cond
Particle Physics	PH3520	15 credits	option	option
Metals and Semiconductors	PH3710	15 credits	option	option
Superconductivity and Magnetism	PH3730	15 credits	option	option
Frontiers of Metrology	PH3810	15 credits	option	option
General Relativity and Cosmology	PH3910	15 credits	option	option

Particle Astrophysics	PH3930	15 credits	option	option
Optics	PH2310	15 credits	Mand Cond	Mand Cond
Electromagnetism	PH2420	15 credits	Mand Cond	
Atomic and Nuclear Physics	PH2510	15 credits		Mand Cond
<i>Minor options</i>	x 15 credits		3	2
Physics options	x 15 credits		2	2

Joint Honours Degree programmes with Physics as an equal element

Students take the following courses:			GF13 Mathematics and Physics
Stage 1			
Scientific Skills 1	PH1140	15 credits	Mand Cond
Mechanics and Relativity	PH1320	15 credits	Mand Cond
Classical Mechanics	PH1620	15 credits	Mand Cond
Physics of the Universe	PH1920	15 credits	Mand Cond
Stage 2			
Scientific Computing Skills	PH2150	15 credits	Mand Cond
Quantum Theory	PH2210	15 credits	Mand Cond
Classical and Statistical Thermodynamics	PH2610	15 credits	Mand Cond
The Solid State	PH2710	15 credits	Mand Cond
Stage 3			
Experimental or Theoretical Project	PH3110	15 credits	Mand Cond

Nonlinear Systems and Chaos	PH3160	15 credits	Mand Cond\$
Electromagnetic Theory	PH3420	15 credits	Mand Cond*
Optics	PH2310	15 credits	Mand Cond
Atomic & Nuclear Physics	PH2510	15 credits	Mand Cond
\$ PH3160 is the same as MT3280 so it may be counted as a Physics or a Maths module			
* PH3420 is the same as MT3240 so it may be counted as a Physics or a Maths module			

Single Honours Degree programmes and Combined Honours programmes taught wholly within Physics Part-Time

Students take the following courses:			F300 Physics	F340 Theoretical Physics	F511 Astrophysics	F370 Physics with Particle Physics	F310 Experimental Physics
Stage 1a							
Mathematics for Scientists 1	PH1110	15 credits	Mand Non-Cond	Mand Non-Cond	Mand Non-Cond	Mand Non-Cond	Mand Non-Cond
Mathematics for Scientists 2	PH1120	15 credits	Mand Non-Cond	Mand Non-Cond	Mand Non-Cond	Mand Non-Cond	Mand Non-Cond
Classical Mechanics	PH1320	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Physics of the Universe	PH1920	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Stage 1b							
Scientific Skills 1	PH1140	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Scientific Skills 2	PH1150	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Fields and Waves	PH1420	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Classical Matter	PH1620	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Stage 2a							
Mathematical Methods	PH2130	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Quantum Mechanics	PH2210	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Atomic and Nuclear Physics	PH2510	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Classical & Statistical Thermodynamics	PH2610	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Stage 2b							
Scientific Computing Skills	PH2150	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond

Optics	PH2310	15 credits	Mand Cond	Mand Cond	Mand Cond		Mand Cond
Electromagnetism	PH2420	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Particle Detectors and Accelerators	PH2520	15 credits				Mand Cond	
The Solid State	PH2710	15 credits	Mand Cond	Mand Cond		Mand Cond	Mand Cond
Astronomy	PH2900	15 credits			Mand Cond		
Stages 3a and 3b							
Experimental or Theoretical Project	PH3110	15 credits	Mand Cond	Mand Cond	Mand Cond	Mand Cond	Mand Cond
Energy	PH3040	15 credits	option	option	option	option	option
Advanced Classical Physics	PH3130	15 credits	option	Mand Cond	Option	Option	option
Further Mathematical Methods	PH3150	15 credits	option	Mand Cond	option	option	option
Nonlinear Systems and Chaos	PH3160	15 credits	option	option		option	option
C++ and Object Oriented Programming	PH3170	15 credits	option	option	option	option	option
Experimental Design	PH3180	15 credits	option	option	option	option	option
Quantum Theory	PH3210	15 credits	option	Mand Cond	Mand Cond	Mand Cond	option
Particle Physics	PH3520	15 credits	option	option	Mand Cond	Mand Cond	option
Metals and Semiconductors	PH3710	15 credits	option	option		option	Mand Cond
Superconductivity & Magnetism	PH3730	15 credits	option	option		option	Mand Cond
Frontiers of Metrology	PH3810	15 credits	option	option		option	Mand Cond

		s					
General Relativity and Cosmology	PH3910	15 credits	option	Mand Cond	Mand Cond	option	
Stellar Astrophysics	PH3920	15 credits	option	option	Mand Cond	option	option
Particle Astrophysics	PH3930	15 credits	option	option	Mand Cond	Mand Cond	option
Planetary Geology and Geophysics	GL3510	15 credits	option	option	option	option	option
Optics	PH2310	15 credits				Mand Cond	
Particle Detectors and Accelerators	PH2520	15 credits	option	option			
The Solid State	PH2710	15 credits			Mand Cond		
Astronomy	PH2900	15 credits	option	option		option	
Physics options	x 15 credits		7	3	1	3	4
In choosing options you may take no more than a total of 30 credits of level-2 courses in the third year.							
Options taken in the second year may not be taken again in the third year.							

In Stage 3 students may choose, with advice, which courses they take in which years. This is largely a matter of personal choice, although a balance of courses between the first and second terms must be ensured.

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Progression and award requirements

The College's [Undergraduate Regulations](#) include full details on progression and award requirements for all undergraduate programmes offered by the College.

On some programmes there may be a requirement to pass specific courses in order to progress to the next stage, or to qualify for a particular degree title and this will put restrictions on courses in which failing marks can be condoned (see programme structure above for details). In the Physics department students must pass PH1110 Mathematics for Scientists 1 and PH1120 Mathematics for Scientists 2 in order to progress.

Additionally, there are requirements on the number of courses that must be passed in order to qualify for particular joint or combined Honours degrees.

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Student support and guidance

- Personal Tutors: All students are allocated a personal tutor who meets with them regularly through the programme. The tutor's role is to advise on academic, pastoral and welfare issues. Students work closely with their personal tutors during the first year in tutorial groups of 3-5. There are similar sized tutorials in the second year. In the final year, academic matters are usually discussed with the Project supervisor in the first instance.
- Senior tutor: provides a back-up system of academic, pastoral and welfare advice.
- Induction programme for orientation and introduction to study skills.
- All staff available and accessible through open-door policy / dedicated office hours system.
- Representation on the Student-Staff Committee.
- Detailed student handbook and course resources.
- Dedicated Departmental study/resource room, with computers, text-books and collection of articles and resources supporting teaching and learning.
- Dedicated Departmental computing facilities and teaching laboratories.
- Extensive supporting materials and learning resources in College libraries and Computer Centre.
- College Careers and Employability Service and Departmental Careers and Employability Tutor.
- Access to all College and University support services, including Student Counselling Service, Health Centre and the Disability and Dyslexia Services for students with disabilities and Specific learning Difficulties.

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Admission requirements

The Department's standard conditional offer is available on their [Course Finder](#) web page. However the Department also has considerable flexibility in its admissions and offers policy and strongly encourages non-standard applicants. Students whose first language is not English may also be asked for a qualification in English language at an appropriate level. For further guidance it may also be useful to contact the [Recruitment and Partnerships Office](#).

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Further learning and career opportunities

Students are provided with training in a range of subject-specific and transferable skills that prepare them for further study in the physical sciences or for entry into a wide range of both scientific and non-vocational careers. Students with appropriate degree classes will be well qualified to apply for Masters training programmes here and elsewhere in a range of scientific or other areas – teaching, for example. Appropriate Masters courses would be suitable for providing a route to Ph.D. research programmes here and elsewhere. There is a range of postgraduate courses nationally that develop and refine individual aspects of these programmes. Career opportunities include such areas as telecommunications, the IT industry, teaching, the civil service and industrial R&D.

Employers' needs are identified mainly from information provided by the Institute of Physics and its Professional Standards Committee. We also maintain contacts with alumni in various commercial companies.

For further details please refer to the [Careers and Employability Service](#).

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Indicators of quality and standards

Royal Holloway's position as one of the UK's leading research-intensive institutions was confirmed by the results of the most recent Research Excellence Framework (REF 2014) conducted by the Higher Education Funding Council (HEFCE). The scoring system for the REF 2014 measures research quality in four categories, with the top score of 4* indicating quality that is world-leading and of the highest standards in terms of originality, significance and rigour and 3* indicating research that is internationally excellent. 81% of the College's research profile was deemed to be within the 4* or 3* categories, an increase of over 20% since 2008. This results for the quality of our research outputs placed Royal Holloway 15th in the UK based on an overall Grade Point Average (GPA) score and 20th in the UK for 4* and 3* research. The Department of Physics is ranked 35 in the UK for research of 4* standard and 24 for 3* and 4* research.

The Department performs well in the various published league tables. In the 2013 National Student Survey we obtained a score of 100% in the category of 'Overall Student Satisfaction'. In 2012 all BSc teaching programmes in the Department were accredited by the Institute of Physics (IoP) for the purpose of partially meeting the educational requirement for becoming a Chartered Physicist.

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List of programmes with details of awards, degree title, accreditation and teaching arrangements

All programmes are taught entirely by staff at Royal Holloway, University of London, and lead to awards of the University of London. All single honours and combined honours degree programmes are accredited by the Institute of Physics and the aims and outcomes reflect its Graduate Skills Base. The QAA subject benchmark statement in Physics describes the general features which one might expect from Honours Degree programmes in the subject, and can therefore be used as a point of reference when reading this document (see www.qaa.ac.uk). UCAS codes are given in parentheses (see www.ucas.ac.uk).

Single Honours Degree programmes in Physics and Combined Honour programmes taught wholly within Physics

BSc Physics (F300)	Available full- or part-time
BSc Astrophysics (F511)	Available full- or part-time
BSc Theoretical Physics (F340)	Available full- or part-time
BSc Physics with Particle Physics (F370)	Available full- or part-time
BSc Experimental Physics (F310)	Available full- or part-time

Combined Honours Degree programmes with Physics as a major component

BSc Physics with Music (F3W3)
BSc Physics with Philosophy (F3V5)

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