

BSc Physics

This document provides a definitive record of the main features of the programme and the learning outcomes that a typical student may reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities provided. This programme specification is intended as a reference point for prospective students, current students, external examiners and academic and support staff involved in delivering the programme and enabling student development and achievement.

Programme Information				
Programme Title	Physics			
Award(s)	BSc			
Associateship	Royal College of Science			
Programme code	F300			
Awarding Institution	Imperial College London			
Teaching Institution	Imperial College London			
Faculty	Faculty of Natural Sciences			
Department	Department of Physics			
Main Location of Study	South Kensington Campus			
Mode and Period of Study	3 academic years full-time			
Cohort Entry Points	Annually in October			
Relevant QAA Benchmark Statement(s) and/or other external reference points	Physics, Astronomy and Astrophysics The Physics Degree (Institute of Physics)			
Total Credits	ECTS:	180	CATS:	360
FHEQ Level	Level 6			
EHEA Level	1 st cycle			
External Accrator(s)	Institute of Physics (IOP) Accreditation received: 2015 Accreditation renewal: 2020			
Specification Details				
Student cohorts covered by specification	2017/18 entry			
Person responsible for the specification	Dr Robert Forsyth (DUGS)			
Date of introduction of programme	2012-13 (date of last review)			

Date of programme specification/revision	August 2017
Programme Overview	
<p>The Physics degree programmes cover a common core over the first two years, including Mathematics, Mechanics, Vibrations & Waves, Electricity & Magnetism, Optics, Thermodynamics & Statistical Physics, Relativity, Quantum Physics, Atomic, Nuclear & Particle Physics, Solid State Physics, and laboratory work. A wide range of elective modules are available in Year 3 of the BSc programme allowing students to receive a broad physics education or specialise in particular areas of physics. A one-term final year project is carried out. The programme aims to prepare students for a wide variety of careers or further Masters level study, both in Physics and in other areas which value the analytical, mathematical and computational skills of a well-trained physics graduate.</p>	
Learning Outcomes	
<p>The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial College degree programme. The Graduate Attributes are available at: www.imperial.ac.uk/students/academic-support/graduate-attributes</p>	
<p>Knowledge and Understanding of:</p> <ul style="list-style-type: none"> • The fundamentals, which all students need to cover, including electromagnetism, optics, quantum and classical mechanics, relativity, statistical physics and thermodynamics, wave phenomena and the properties of matter. • The application of the fundamental principles to particular areas. These include nuclear and particle physics, condensed matter physics and atomic structure. • A few subjects which students study in greater depth and appreciate current developments at the frontiers of the subject. <p>Intellectual Skills - students will learn how to:</p> <ul style="list-style-type: none"> • Formulate and tackle problems in physics, including the identification of appropriate physical principles and the use of special and limiting cases and order-of-magnitude estimates, to arrive at a solution which is presented with an explicit statement of assumptions and approximations. • Use mathematics to describe the physical world, selecting appropriate equations, constructing models, interpreting mathematical results and critically comparing them with experiment and observation. • Participate, under supervision, in an extended physics investigation. <p>Practical Skills - students will learn how to:</p> <ul style="list-style-type: none"> • Plan, execute and report the results of a complex extended experiment or investigation, using appropriate methods to analyse data and to evaluate the level of its uncertainty. • Use appropriate software such as programming languages and packages in a physics investigation. <p>Transferable Skills - students will learn how to:</p> <ul style="list-style-type: none"> • Solve open-ended problems and problems with well-defined solutions by formulating problems in precise terms, identifying key issues and trying different approaches in order to make progress. 	

- Carry out an independent investigation using textbooks and other available literature, searching databases and interacting with colleagues and staff to extract important information.
- Communicate effectively by listening carefully and presenting complex information in a clear and concise manner orally, on paper and using ICT.
- Use analytical skills, paying attention to detail and using technical language correctly, to manipulate precise and intricate ideas, and to construct logical arguments.
- Use ICT skills for communication and analysis.
- Work independently, use their initiative, meet deadlines, plan and execute a project.
- Work in groups, interacting constructively with others.

Entry Requirements

Academic Requirement	Grade Requirement	Normally a minimum of A*A*A overall
	Subject Requirements	A* in Mathematics A in Physics (or a comparable qualification recognised by the College).
	Excluded Subjects	General Studies and Critical Thinking are not accepted.
International Baccalaureate (IB)	Grade Requirement	Minimum 39 points overall
	Subject Requirements	7, 6, 6 at higher level which must include Mathematics and Physics (or a comparable qualification recognised by the College).
GCSE Requirements		None
English Language Requirement		Standard requirement IELTS score of 6.5 overall (minimum 6.0 in all elements)
Admissions Tests		Candidates may be asked to undertake an admissions test set by the College in order to provide additional information for the Admissions Tutor in support of an application.
Interview		Yes

The programme's competency standards documents can be found at:
<https://www.imperial.ac.uk/natural-sciences/departments/physics/students/current-students/student-welfare/>

Learning & Teaching Strategy

Scheduled Learning & Teaching Methods	<ul style="list-style-type: none"> • Lectures • Tutorials • Laboratory Classes • Computing Labs
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	<ul style="list-style-type: none"> • Office hours 				
E-learning & Blended Learning Methods	<ul style="list-style-type: none"> • Support of lecture courses through online course materials and lecture recordings 				
Project and Placement Learning Methods	<ul style="list-style-type: none"> • Group and individual project work 				
Assessment Strategy					
Assessment Methods	<ul style="list-style-type: none"> • Written Examination • Assessed problem sheets • Laboratory notebook • Laboratory and project reports • Essay • Interview • Group and individual presentations 				
Academic Feedback Policy					
<ul style="list-style-type: none"> • All students receive feedback on their progress from their academic tutor in weekly tutorials. • Assessed coursework in Years 1 and 2 is returned to students with comments within approximately one week of submission. Students may discuss their marks with their academic tutor if they wish. • Laboratory and computing reports are returned to students normally within 2 weeks of submission and students have the opportunity of discussing their report with the marker if they wish. Heads of Laboratories are responsible for ensuring that feedback is prompt and effective • Students are encouraged to discuss their examination performance with their Personal Tutor. 					
Re-sit Policy					
The College's Policy on Re-sits is available at: http://www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/					
Mitigating Circumstances Policy					
The College's Policy on Mitigating Circumstances is available at: http://www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/					
Programme Structure					
Year One	Pre-session	Term One	Term Two	Term Three	Term Four
Core Modules	0	3.5	3.85	0.65	0
Elective Modules	0	0	0	0	0
Projects	0	0	0	1	0
Year Two	Pre-session	Term One	Term Two	Term Three	Term Four

Core Modules	0	4.5	3.9	0.6	0
Elective Modules	0	0	1	0	0
Projects	0	0	0	0	0
Year Three	Pre-session	Term One	Term Two	Term Three	Term Four
Core Modules (typical ¹)	0	2.5	3.5	0	0
Elective Modules (typical ²)	0	2	2	0	0
Projects (typical ³)	0	1	0	0	0
Assessment Dates & Deadlines					
Year One					
Written Examinations		May and June			
Coursework Assessments		Continuous			
Project Deadlines		June			
Practical Assessments		Continuous			
Year Two					
Written Examinations		May and June			
Coursework Assessments		Continuous			
Project Deadlines		None			
Practical Assessments		Continuous			
Year Three					
Written Examinations		January (elective), May and June (core and electives)			
Coursework Assessments		Continuous			
Project Deadlines		Term 1 project: January. Term 2 project: May			
Practical Assessments		Continuous			

¹ Students have a choice to take Lab either Term 1 or Term 2. Professional Skills is either taken in Term 1 or Term 2 depending on which term Lab is taken.

² Students must take either 15 or 18 ECTS of electives in their third year. We advise students to balance their work over two terms, but there is flexibility.

³ Students must take a project. It can be in either Term 1 or Term 2.

Assessment Structure

Marking Scheme

Year One

A student must:

- Achieve an aggregate mark of at least 40% in each element
- Achieve a mark of 65% in Year 1 Maths to take Mathematical Methods in Year 2

Year Two

A student must:

- Achieve an aggregate mark of at least 40% in each element

Year Three

A student must:

- Achieve an aggregate mark of at least 40% in each element
- Attempt a project or essay project (Elective F)

Final Degree Classifications

Third – a student must achieve an aggregate mark of 40%

Lower Second – a student must achieve an aggregate mark of 50%

Upper Second – a student must achieve an aggregate mark of 60%

First - a student must achieve an aggregate mark of 70%

Candidates who fall no more than 2.5% below the minimum mark for a higher honours classification shall be eligible for review of their final classification. This review will be at the discretion of the Board of Examiners and will allow promotion into the higher class for students who have achieved the higher class in 50% or more of the total credits awarded for the programme weighted by year.

Year	% Year Weighting	Module	Term(s)	ECTS	% Module Weighting
Year One	11.11%	Mathematics	1 & 2	15	25%
		Measurement and Uncertainty	1	0	0%
		Mechanics, Vibrations & Waves	1	8	13.33%
		Electricity & Magnetism, Relativity	2 & 3	7.5	12.5%
		Quantum Physics and Structure of Matter	2 & 3	7.5	12.5%
		Advanced Electronics	2	4	6.67%
		Laboratory and Computing I	1 & 2	9	15%
		Professional Skills and Basic Electronics I	1 & 2	5	8.33%
		Project	3	4	6.67%
Year Two	33.33%	Atomic, Nuclear and Particle Physics	2 & 3	6	10%
		Electromagnetism and Optics	2 & 3	9	15%
		Professional Skills II	1	2	3.33%
		Quantum Mechanics	1	6	10%
		Solid State Physics	2	5	8.33%
		Mathematics and Statistics of Measurement	1	9	15%
		Thermodynamics and Statistical Physics	2	7	11.67%
		Laboratory and Computing II	1 & 2	10	16.67%
		<i>One module from elective groups A, B or G</i>	2	6	10%
Year Three	55.56%	Element I: Core Physics, including Physics Laboratory III, Fluid Dynamics, Light & Matter and Physics of the Universe	1 & 2	18	30%
		Element II: BSc Options between 24-27 ECTS from <i>elective groups A-G</i> <ul style="list-style-type: none"> • <i>one must be from group F</i> • <i>maximum of one each from groups⁴ A & D</i> • <i>maximum of one in total from groups B & E</i> 	1 & 2	24 or 27	40%
		Element III: Comprehensive Physics and Professional Skills III	1 & 2	18	30%

⁴ With the agreement of the DUGS in both departments, this may be replaced with an elective module from another Imperial College department subject to space being available.

Module List												
Code	Title	Core/Elective	Year	L&T Hours	Ind. Study Hours	Placement Hours	Total Hours	% Written Exam	% Course-work	% Practical	FHEQ Level	ECTS
PH1-MU	Measurement and Uncertainty	CORE	1	4	4	0	0	0%	0%	0%	4	0
MPH.1	Mathematics	CORE	1	142	233	0	375	85%	15%	0%	4	15
P1.1.1	Mechanics, Vibrations & Waves	CORE	1	72	128	0	200	85%	15%	0%	4	8
P1.2.1	Electricity & Magnetism, Relativity	CORE	1	64	123.5	0	187.5	85%	15%	0%	4	7.5
P1.3.1	Quantum Physics & Structure of Matter	CORE	1	73	114.5	0	187.5	85%	15%	0%	4	7.5
P1.8	Advanced Electronics	CORE	1	47	53	0	100	0%	100%	0%	4	4
PL1.1	Laboratory and Computing I	CORE	1	75	150	0	225	0%	50%	50%	4	9
P1.7	Professional Skills and Basic Electronics I	CORE	1	33	92	0	125	57%	43%	0%	4	5
PP1.1	Project	CORE	1	83	17	0	100	0%	50%	50%	4	4
P2.8	Atomic , Nuclear and Particle Physics	CORE	2	54	96	0	150	85%	15%	0%	5	6
P2.4	Electromagnetism & Optics	CORE	2	80	145	0	225	85%	15%	0%	5	9
P2.7	Professional Skills II	CORE	2	4	46	0	50	0%	100%	0%	5	2
P2.1	Quantum Mechanics	CORE	2	58	92	0	150	85%	15%	0%	5	6
P2.9	Solid State Physics	CORE	2	44	81	0	125	85%	15%	0%	5	5
P2.5	Mathematics & Statistics of Measurement	CORE	2	80	145	0	225	85%	15%	0%	5	9
P2.2	Thermodynamics & Statistical Physics	CORE	2	71	104	0	175	85%	15%	0%	5	7
PL2.1	Laboratory and Computing II	CORE	2	121	129	0	250	0%	50%	50%	5	10

Module List												
Code	Title	Core/Elective	Year	L&T Hours	Ind. Study Hours	Place-ment Hours	Total Hours	% Written Exam	% Course-work	% Practical	FHEQ Level	ECTS
MPh2	Mathematical Methods ⁵	ELECTIVE (A)	2 or 3	57	93	0	150	100%	0%	0%	5	6
PO2.3	Environmental Physics	ELECTIVE (A)	2 or 3	47	103	0	150	100%	0%	0%	5	6
PO2.1	Sun, Stars & Planets	ELECTIVE (A)	2 or 3	49	101	0	150	100%	0%	0%	5	6
N/A	Imperial Horizons	ELECTIVE (B)	2 or 3	Various			150	Various				6
P.COMP12	Comprehensive Physics	CORE	3	20	380	0	400	100%	0%	0%	6	16
P3.4	Professional Skills III	CORE	3	4	46	0	50	0%	0%	100%	6	2
P3.12b	Fluid Dynamics	CORE	3	16	21.5	0	37.5	100%	0%	0%	6	1.5
P3.11	Light & Matter	CORE	3	53	97	0	150	100%	0%	0%	6	6
PL3	Physics Laboratory III	CORE	3	113	37	0	150	0%	50%	50%	6	6
P3.12a	Physics of the Universe	CORE	3	41	71.5	0	112.5	100%	0%	0%	6	4.5
PP3.3	Physics Project	ELECTIVE (F)	3	90	135	0	225	0%	100%	0%	6	9
PEP3.1	Physics Essay III	ELECTIVE (F)	3	90	135	0	225	0%	100%	0%	6	9
PO3.4	Advanced Classical Physics	ELECTIVE (C)	3	57	93	0	150	100%	0%	0%	6	6
PO3.6	Astrophysics	ELECTIVE (C)	3	47	103	0	150	100%	0%	0%	6	6
PO3.9	Communicating Physics	ELECTIVE (G)	2 or 3	45	105	0	150	0%	100%	0%	6	6
PT3.5	Computational Physics	ELECTIVE (C)	3	58	92	0	150	40%	60%	0%	6	6
PT3.6	Complexity & Networks	ELECTIVE (C)	3	57	93	0	150	20%	80%	0%	6	6

⁵ Students must have 65% or more in Year 1 Mathematics to take Mathematical Methods in Year 2.

Module List												
Code	Title	Core/Elective	Year	L&T Hours	Ind. Study Hours	Placement Hours	Total Hours	% Written Exam	% Course-work	% Practical	FHEQ Level	ECTS
PT3.1	Foundations of Quantum Mechanics	ELECTIVE (C)	3	57	93	0	150	100%	0%	0%	6	6
PT3.2	Group Theory	ELECTIVE (C)	3	57	93	0	150	100%	0%	0%	6	6
PO3.3a	Lasers	ELECTIVE (C)	3	23.5	51.5	0	75	100%	0%	0%	6	3
PO3.3b	Imaging & Biophotonics	ELECTIVE (C)	3	23.5	51.5	0	75	100%	0%	0%	6	3
PO3.7a	Medical Imaging: X-Rays & Ultrasound	ELECTIVE (C)	3	23.5	51.5	0	75	100%	0%	0%	6	3
PO3.7b	Medical Imaging: Nuclear Diagnostics & MRI	ELECTIVE (C)	3	23.5	51.5	0	75	100%	0%	0%	6	3
PO3.2	Plasma Physics	ELECTIVE (C)	3	47	103	0	150	100%	0%	0%	6	6
PO3.5	Principles of Instrumentation	ELECTIVE (C)	3	58	92	0	150	80%	20%	0%	6	6
PT3.4	Statistical Mechanics	ELECTIVE (C)	3	57	93	0	150	100%	0%	0%	6	6
PT4.1	Advanced Particle Physics	ELECTIVE (D)	3	57	93	0	150	100%	0%	0%	7	6
PO4.1	Atmospheric Physics	ELECTIVE (D)	3	57	93	0	150	100%	0%	0%	7	6
BE4-MCNS	Computational Neuroscience	ELECTIVE (D)	3	57	93	0	150	100%	0%	0%	7	6
PO4.10	Nanotechnology in Consumer Electronics	ELECTIVE (D)	3	23.5	51.5	0	75	100%	0%	0%	7	3
PT4.2	General Relativity	ELECTIVE (D)	3	57	93	0	150	100%	0%	0%	7	6
PO4.11	Advanced Hydrodynamics	ELECTIVE (D)	3	23.5	51.5	0	75	100%	0%	0%	7	3
PH4-LT	Laser Technology	ELECTIVE (D)	3	47	103	0	150	100%	0%	0%	7	6
PO4.4a	Optical Communications	ELECTIVE (D)	3	23.5	51.5	0	75	100%	0%	0%	7	3
PO4.4b	Information Theory	ELECTIVE (D)	3	23.5	51.5	0	75	100%	0%	0%	7	3

Module List												
Code	Title	Core/Elective	Year	L&T Hours	Ind. Study Hours	Placement Hours	Total Hours	% Written Exam	% Course-work	% Practical	FHEQ Level	ECTS
PO4.9	Plasmonics & Metamaterials	ELECTIVE (D)	3	47	103	0	150	100%	0%	0%	7	6
PT4.4	Quantum Field Theory	ELECTIVE (D)	3	57	143	0	200	100%	0%	0%	7	8
PT4.8	Quantum Information	ELECTIVE (D)	3	57	93	0	150	100%	0%	0%	7	6
PO4.6	Quantum Optics	ELECTIVE (D)	3	47	103	0	150	100%	0%	0%	7	6
PT4.5	Quantum Theory of Matter	ELECTIVE (D)	3	57	93	0	150	100%	0%	0%	7	6
PO4.5	Cosmology	ELECTIVE (D)	3	57	93	0	150	100%	0%	0%	7	6
PO4.3	Space Physics	ELECTIVE (D)	3	47	103	0	150	100%	0%	0%	7	6
PT4.6	Unification	ELECTIVE (D)	3	57	143	0	200	100%	0%	0%	7	8
PO4.12	Entrepreneurship for Physicists	ELECTIVE (D)	3	20	130	0	150	0%	100%	0%	7	6
N/A	Business for Professional Engineers & Scientists	ELECTIVE (E)	3	Various			150	Various			6	

Supporting Information

The Programme Handbook is available at:

<http://www.imperial.ac.uk/natural-sciences/departments/physics/students/current-students/undergraduates/physics-student-handbook/>

The Module Handbook is available at:

<https://www.imperial.ac.uk/natural-sciences/departments/physics/students/current-students/undergraduate-and-masters-degree-courses-list/>

The College's entry requirements for undergraduate programmes can be found at:

www.imperial.ac.uk/study/ug/apply/requirements/

The College's Quality & Enhancement Framework is available at:

www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance

Imperial College is an independent corporation whose legal status derives from a Royal Charter granted under Letters Patent in 1907. In 2007 a Supplemental Charter and Statutes was granted by HM Queen Elizabeth II. This Supplemental Charter, which came into force on the date of the College's Centenary, 8th July 2007, established the College as a University with the name and style of "The Imperial College of Science, Technology and Medicine".

<http://www.imperial.ac.uk/admin-services/secretariat/college-governance/charters/>

Imperial College London is regulated by the Higher Education Funding Council for England (HEFCE)

<http://www.hefce.ac.uk/reg/register/>