Programme Information		
Programme Title	Programme Code	HECoS Code
Physics	F300	For Registry Use Only

Award	Length of Study	Mode of Study	Entry Point(s)	Total Credits	
				ECTS	CATS
BSc	3 academic years	Full-time	Annually in October	180	360
DipHE(*) – F303D	N/A	N/A	N/A	120	240
CertHE(*) – F303C	N/A	N/A	N/A	60	120

(*)The DipHE and CertHE exit awards are not accredited by any professional body. They may be offered to a student as an exit award at the discretion of the board of examiners. You must apply to and join the BSc.

Ownership			
Awarding Institution	Imperial College London	Faculty	Natural Sciences
Teaching Institution	Imperial College London	Department	Physics
Associateship	Royal College of Science	Main Location(s) of Study	South Kensington Campus
External Reference			
Relevant QAA Benchmark Statement(s) and/or other external reference points		Physics, Astronomy and Astrophysics The Physics Degree (Institute of Physics)	
FHEQ Level		Level 6	
EHEA Level		1st cycle	
External Accreditor(s) (if applicable)			
External Accreditor 1:	Institute of Physics (IoP)		
Accreditation received:	2022	Accreditation renewal:	2027
Collaborative Provision			
Collaborative partner	Collaboration type	Agreement effective date	Agreement expiry date
N/A	N/A	N/A	N/A

Specification Details	
Programme Lead	Dr Derek Lee (DUGS)
Student cohorts covered by specification	2024-25 entry
Date of introduction of programme	October 2019
Date of programme specification/revision	October 2023

Programme Overview

Physics is the *fundamental* science whose principles and laws underpin most other science and engineering disciplines. At the heart of a physics degree is the ability to solve problems concerning the physical world. Problems in physics can relate to phenomena on gigantic scales such as the cosmos, or minutely small ones (e.g. quantum particles) and virtually any other scale in between. Throughout your physics degree programme, you will develop a large range of problem-solving skills that can also be applied to many other (seemingly unrelated) situations. Hence, by the time you complete your physics degree, you would have built a strong platform with which to launch a professional career from along many different trajectories.

The bulk of your Physics degree programme will be taught within the physics department at our South Kensington campus. Consistently at the forefront of research and education and comprising nine internationally renowned research groups, the Blackett Laboratory is amongst the strongest in the UK - containing many world-leading researchers. These same researchers will be the ones who deliver the programme to you, including graduate teaching assistants (GTA) in labs and tutorials, to postdoctoral researchers and academic staff who have a high level of expertise in their specific field.

Your Physics degree programme will comprise core modules, compulsory modules, elective modules, laboratory work, project work, and collaborative group work[1]. The core modules are largely common for most Physics degree programmes and include mathematics, mechanics, vibrations and waves, electromagnetism, optics, thermodynamics, statistical physics, relativity, quantum physics, atomic, nuclear and particle physics, and solid state physics. The majority of the core modules are taught in Years 1 & 2. In Year 3 of the BSc programme alongside your core and compulsory modules you are free to choose from a wide range of elective modules, reflecting the diverse research specialisms of the Department. You will therefore have the opportunity to either specialise in a specific area of Physics, or receive a broader Physics education. In your final year, you will also carry out a major project under supervision with one of our world-leading research groups.

Throughout your physics degree, you are also provided with the opportunity to develop a broad range of professional skills to prepare you for the world outside of university. Demand for our graduates is high; they are much sought after for their analytical and problem-solving skills. In general, about half of those who graduate go on to study further at postgraduate level, such as MSc or PhD degrees whether in the UK or abroad. Others gain employment in a wide range of graduate destinations ranging from traditional 'technical' industries, such as oil and gas, to telecommunications, business consultancy, banking, finance, and the public sector such as education, health, or defence. Whether you're sure what you want to do after graduation, or if you simply have no idea at this stage, this physics degree will keep your career options open.

[1] **Core** modules are those which serve a fundamental role within the curriculum, and for which achievement of the credits for that module is essential for the achievement of the target award. Core modules must therefore be taken and passed in order to achieve that named award. **Compulsory** modules are those which are designated as necessary to be taken as part of the programme syllabus. Compulsory modules can be compensated. **Elective** modules are those which are in the same subject area as the field of study and are offered to students in order to offer an element of choice in the curriculum and from which students are able to select. Elective modules can be compensated.

Learning Outcomes

On completion of Year 1, you will be able to:

1. demonstrate knowledge and a basic understanding of some of the fundamental principles, concepts and associated mathematical tools of physics including mechanics and special relativity, oscillations, waves, optics and electricity and magnetism;
2. appreciate the importance of mathematics to physics and be able to express physics problems using appropriate mathematical language.
3. solve well-defined problems in physics, identifying appropriate principles and selecting and using mathematical tools, making appropriate simplifications, estimations and approximations;
4. apply basic computational techniques to analyse data and solve scientific problems numerically;
5. use a range of basic physics laboratory equipment, design and run experiments to test basic scientific hypotheses, keep records, make measurements, use statistical analysis for experimental data and uncertainties and report findings;
6. work independently and constructively in small groups to plan and execute well-defined tasks and projects and meet deadlines.

In addition, on completion of Year 2, you will be able to:

7. demonstrate knowledge and an understanding of some of the fundamental models and concepts and associated mathematical tools of modern physics and their applications, including thermodynamics, quantum physics, and electromagnetism;
8. use computer programming to tackle well-defined and open-ended problems in physics;
9. plan and execute experiments to investigate existing theories and models and extend these experiments to test hypotheses;
10. organise and communicate complex scientific information to a range of audiences in written forms;
11. adopt an evidence-based approach making use, as appropriate, of mathematics, experiment and observation in line with the fundamental nature of physics as a science founded on mathematics, experiment and observation.

In addition, on completion of Year 3, you will be able to:

12. apply an integrated understanding of classical and modern physics and associated mathematical tools and use them to tackle both well-defined and open-ended problems making appropriate simplifications, estimations and approximations, to formulate solutions and present them logically;
13. demonstrate knowledge and understanding of the fundamental models and concepts of physics and their applications.
14. apply in-depth knowledge and understanding in several chosen advanced subjects in physics;
15. carry out open-ended extended investigations with supervision, using textbooks and primary scientific literature, analysing information and sources critically and presenting findings clearly;
16. work constructively as part of a team, planning and executing extended practical or theoretical projects and present findings in written and oral forms making use of information and communication technologies;
17. be objective, open-minded, critically-thinking and curious and have the confidence to apply understanding and skill to tackle new and complex challenges within and beyond the discipline;
18. reflect critically on understanding, learning and skills, identifying strengths and areas for further development, to grow continually in expertise.

The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial degree programme. The Graduate Attributes are available at: www.imperial.ac.uk/about/education/our-graduates/

Entry Requirements

Academic Requirement	A-level requirement: normally a minimum of A*A*A overall. Subject specific requirements: A* in Mathematics, A in Physics (or a comparable qualification recognised by the university). General Studies and Critical Thinking are not accepted.

	IB requirements: normally a minimum overall mark of 40. Subject specific requirement: 7, 6, 6 at higher level which must include Mathematics, Physics, and Chemistry (or a comparable qualification recognised by the university). For further information on entry requirements, please go to www.imperial.ac.uk/study/apply/undergraduate/entry-requirements/
Non-academic Requirements	An ATAS certificate is required for all non-EEA/Swiss nationals who require a visa to study in the UK.
English Language Requirement	Standard requirement Please check for other Accepted English Qualifications
Admissions Test/Interview	All applicants demonstrating suitable academic potential will be required to take an online Admissions Test which will cover basic school physics and mathematics. The results of the test will be used along with all other application information in a holistic review to inform the selection for offers made.

The programme's competency standards documents are available from the department.

Learning & Teaching Approach

The programme is delivered using a range of methods including lectures, tutorials, laboratory classes, computational classes and directed supervision on projects. The exact nature of the session depends on the content, the number of people in the class, the point in the programme and the personal styles and preferences of the module coordinators.

Lectures have between about 250 students for core modules to as few as 20 for some electives. The size of the lecture theatre is selected to cater for the number of students on the module. Lectures are typically 50-minute oral presentations augmented, when appropriate, with the use of handwritten notes (on a board or visualiser), handouts of notes, multimedia presentations, live demonstrations, video clips, quizzes, in-class discussion and in-class exercises. You will sometimes be asked to do preparation in advance of sessions, for example directed reading, revision of key material, or completion of problems. Lecturers provide **office hours** - drop in sessions where students can turn up without appointment to ask lecturers any questions they wish about the module. Lecturers will also supply directed learning guidance, often in the form of a weekly problem sheet with a range of self-study exercises and directed reading. Lectures are supported through online materials that may include notes, problem sheets and solutions, additional reading resources, interactive demonstrations and worksheets, lecture recordings, questionnaires and communications.

Tutorials and Seminars can range from small group teaching sessions with typically about 20>60 students with a lecturer and graduate teaching assistant to smaller sessions with four students and a lecturer. These may be used for problem solving, group exercises, discussion of problem sheets and questions arising from lectures. Tutorials often lead to open exchange and discussion of ideas going beyond the syllabus.

Laboratory sessions range from specific and directed training on use of equipment and basic procedures on lab protocol including basic health & safety and hazard awareness, through to open-ended experiments covering several hours of lab time with on-hand guidance from demonstrators to longer research projects lasting several weeks with minimal guidance. In most sessions you work with a lab partner. You will also work with laboratory

technicians whom you will be expected to liaise with regarding many aspects of laboratory work. You will be trained in keeping a lab book and in scientific report writing. You will be expected to write up work as formal lab reports with the exact rubric becoming more advanced and nuanced as the degree progresses; by the end of year 3 the reports you submit will be approaching the levels required by peer reviewed scientific journals.

Computing is usually taught in the department's computer teaching suite. Computing sessions for core modules will typically be in groups of about 30 students supported by a group of 4 or 5 teaching staff comprising graduate teaching assistants and at least one member of academic staff.

Projects are typically substantial pieces of work that may be done in pairs, small groups, or sometimes individually. You will have several opportunities to undertake projects, including a summer project in Term 3 of Year 1 and a BSc project in Term 1 or 2 of Year 3. Project supervision typically involves weekly meetings with a supervisor but can be more involved; in situations where students work in the same lab as the supervisor the contact is likely to be much more frequent.

Overall Workload

Your overall workload consists of face-to-face sessions and independent learning. While your actual contact hours may vary according to the optional modules you choose to study, the following gives an indication of how much time you will need to allocate to different activities at each level of the programme. At Imperial, each ECTS credit taken equates to an expected total study time of 25 hours. Therefore, the expected total study time is 1,500 hours per year. During the first two years, scheduled contact hours are envisaged to take up about half the time you work on the programme. This includes approximately 10-15 hours of lectures and tutorials and 6 hours of laboratory work per week. The rest of the time is typically spent on independent learning, such as working on problem sheets, revising course material, writing lab reports and background reading. In Year 3, the pattern of work depends on your chosen electives, but you can typically expect to spend about 200 hours over the year in face-to-face sessions such as lectures, tutorials and supervision meetings, with the rest on project work and independent learning.

Assessment Strategy

Assessment Methods

A variety of assessment methods will be used to test your understanding. Assessments may be formative, summative or both.

Formative assessments do not contribute to the module mark but provide information on your progress as an individual and in the context of the teaching session. This allows you to learn by using your new skills to solve problems and receive feedback on your performance to guide your future learning. This supports you to achieve a better performance in the summative assessments which do count towards your module marks. Formative assessments also provide feedback to the teaching staff which allow us to adapt our teaching to the needs of the learner.

Summative assessments are used to assess your learning against the intended module learning outcomes and contribute towards your achievement of the programme learning outcomes, detailed above. All modules contain aspects of summative assessment and these assessments will contribute towards your mark for each year. Usually the grades for summative assessment are assigned by lecturers or graduate teaching assistant but occasionally your work will be peer assessed (i.e. your grade is provided by one or more of your fellow students), but always moderated and approved by a member of staff.

The choice of assessment method is largely determined by the nature of the module and its learning outcomes.

The main types of assessment include the following.

- **Computing reports and Laboratory reports** are reports that are usually marked by a graduate teaching assistant (and checked by a member of staff) or by a member of staff before being returned to you. They often carry a summative grade.
- **Scientific writing exercises** may have both summative and formative assessment components.
- **Project reports** are typically summatively-assessed major pieces of work that are written as part of a project such as the Year One Project and the BSc project.
- **Oral presentations and/or vivas** may be done individually, sometimes in a pair and sometimes in a larger group. They often have a small summative grade component but some are wholly formative assessment with no grade attached.
- **Poster presentations** can be both summative and formative.
- **Written examinations** are associated with most non-laboratory and computing modules and often carry a relatively high fraction of the grade for the module.

Other in-course assessments that some modules may have include the following.

- **Written problems** may contain a combination of summative and formative assessment, with some problems for submission for assessment (either online, often as multiple choice, or by handwriting and paper delivery).
- **Progress tests and quizzes** feature in many modules and are often purely formative but may contain a summative grade.
- **Mastery tests** are exam style tests on the most essential elements of a module. They typically have a high passing grade and must be passed. You are permitted to take the mastery tests on more than one occasion.

The table below is indicative of the balance of assessment based on a typical pathway through the course.

	Year 1	**Year 2**	**Year 3**
Coursework	25%	20%	15%
Practical	15%	10%	15%
Written Examination	60%	70%	70%

Academic Feedback Policy

Feedback is an essential part of learning and the Department gives high priority to providing timely and high-quality feedback to students on all modules throughout the degree. Feedback highlights strengths and weaknesses of any previous work and identify areas for improvement. Feedback works best as an active exercise and you are expected to engage with all forms of feedback to maximise what you can get out of your learning.

Feedback will be provided for all assessments carried out as part of this programme and takes many forms depending on the nature and learning outcomes of the module involved. Examples of feedback styles are:

- Oral feedback to a group may be provided during or after lectures
- Personal feedback may follow from discussion with lecturers during office hours or meetings with Personal Tutors
- Interactive feedback may follow from peer group discussion
- Written feedback may take the form of solutions to coursework or writing on formal reports.

It is important to realise that not all feedback is structured and written into module specifications. Some of the most important feedback comes from one's own self-reflection and from real-time discussion (orally or online) with peers, graduate teaching assistants and lecturers.

For formal assessments, Imperial's policy is to provide formal feedback within 10 working days of submission for most exercises and the Department of Physics adheres to this policy. For any exceptions, you will be informed in advance of the coursework being set.

Exams grades are provided after the examiners' meetings. Dates for these meeting will be provided during the academic year.

Imperial's Policy on Academic Feedback and guidance on issuing provisional marks to students is available at:

www.imperial.ac.uk/about/governance/academic-governance/academic-policy/exams-and-assessment/

Re-sit Policy
Imperial's Policy on Re-sits is available at: www.imperial.ac.uk/about/governance/academic-governance/academic-policy/exams-and-assessment/

Mitigating Circumstances Policy
Imperial's Policy on Mitigating Circumstances is available at: www.imperial.ac.uk/about/governance/academic-governance/academic-policy/exams-and-assessment/

Additional Programme Costs		
This section should outline any additional costs relevant to this programme which are not included in students' tuition fees.		
Description	Mandatory/Optional	Approximate cost
N/A	N/A	N/A

Important notice: The Programme Specifications are the result of a large curriculum and pedagogy reform implemented by the Department and supported by the Learning and Teaching Strategy of Imperial College London. The modules, structure and assessments presented in this Programme Specification are correct at time of publication but might change as a result of student and staff feedback and the introduction of new or innovative approaches to teaching and learning. You will be consulted and notified in a timely manner of any changes to this document.

Programme Structure

Year 1 – FHEQ Level 4
You study all core and compulsory modules. You choose one elective from group A

Code	Module Title	Core/ Compulsory/ Elective	Group*	Term	Credits**
PHYS40001	Practical Physics: Laboratory, Computing and Problem Solving	Compulsory		Autumn-Spring	10
PHYS40004	Vector Fields, Electricity and Magnetism	Core		Spring	7.5
PHYS40002	Mechanics and Relativity	Core		Autumn-Summer	15
PHYS40003	Oscillations and Waves	Core		Autumn-Spring	15
PHYS40005	Statistics of Measurement and the Summer Project	Compulsory		Spring-Summer	7.5
PHYS40006	Advanced Electronics	Elective	A	Spring-Summer	5
PHYS40007	Mathematical Analysis	Elective	A	Spring-Summer	5
				Credit Total	60

Year 2 - FHEQ Level 5
You study all core and compulsory modules. You must select a group B module and two electives from group C.

Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits
PHYS50001	Advanced Practical Physics	Compulsory		Autumn-Spring	10
PHYS50002	Thermal Physics and Structure of Matter	Core		Autumn-Spring	10
PHYS50003	Differential Equations and Electromagnetism	Core		Autumn-Spring	10
PHYS50004	Quantum Physics	Core		Autumn-Spring	15
N/A	I-Explore	Co-Curricular	B	Autumn-Summer	5/7.5
PHYS50005	Communicating Physics	Elective	C	Autumn-Summer	5
PHYS50006	Suns, Stars and Planets	Elective	C	Autumn	5

PHYS50007	Mathematical Methods	Elective	C	Spring	5
PHYS50008	Environmental Physics	Elective	C	Spring	5
				Credit Total	60/62.5

Year 3 - FHEQ Level 6
You study all core and compulsory modules and one of the project modules from group E. You choose elective modules to a total of 20-22.5. credits, from groups D and F with a maximum of one module from group F (FHEQ level 7). We advise you to balance your work over Terms 1 and 2, but there is flexibility. With the agreement of the DUGS in both departments, up to 7.5 credits may be replaced with an elective module from another Imperial department subject to space being available.

Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits
PHYS60004	Third Year Physics Laboratory	Compulsory		Autumn or Spring	7.5
PHYS60001	Nuclear and Particle Physics	Core		Spring	5
PHYS60002	Comprehensives	Core		Autumn-Summer	15
PHYS60003	Solid State Physics	Core		Autumn	5
PHYS60006	Lasers	Elective	D	Spring	5
PHYS60007	Physics of Medical Imaging and Radiotherapy	Elective	D	Spring	7.5
PHYS60008	Principles of Instrumentation	Elective	D	Spring	7.5
PHYS60009	Statistical Mechanics	Elective	D	Autumn	7.5
PHYS60005	Advanced Classical Physics	Elective	D	Autumn	7.5
PHYS60010	Complexity and Networks (not running in 2024-25)	Elective	D	Spring	7.5
PHYS60011	Foundations of Quantum Mechanics	Elective	D	Spring	7.5
PHYS60012	Computational Physics	Elective	D	Autumn-Spring	7.5
PHYS60013	Plasma Physics	Elective	D	Spring	7.5
PHYS60014	Astrophysics	Elective	D	Autumn	7.5
PHYS60015	Group Theory	Elective	D	Autumn	7.5
PHYS60022	Data Science and Machine Learning for Physics	Elective	D	Spring - Summer	7.5
PHYS60016	Year 3 Project	Elective	E	Autumn or Spring	7.5
PHYS60017	Essay Project	Elective	E	Autumn or	7.5

				Spring	
PHYS70008	Quantum Field Theory[2]	Elective	F	Autumn	7.5
PHYS70012	Advanced Particle Physics	Elective	F	Spring	7.5
PHYS70006	General Relativity	Elective	F	Autumn	7.5
PHYS70014	Cosmology	Elective	F	Spring	7.5
PHYS70016	Hydrodynamics	Elective	F	Spring	5
PHYS70019	Space Physics	Elective	F	Spring	7.5
PHYS70009	Quantum Information[3]	Elective	F	Autumn	7.5
PHYS70017	Laser Technology	Elective	F	Spring	7.5
PHYS70011	Unification - The Standard Model[4]	Elective	F	Autumn	7.5
PHYS70018	Quantum Theory of Matter	Elective	F	Spring	7.5
PHYS70010	Quantum Optics	Elective	F	Autumn	7.5
PHYS70005	Introduction to Plasmonics and Metamaterials (not running in 2024-25)	Elective	F	Autumn	7.5
PHYS70004	Information Theory	Elective	F	Autumn	5
PHYS70015	Entrepreneurship for Physicists (not running in 2024-25)	Elective	F	Spring	7.5
PHYS70003	Concepts in Device Physics	Elective	F	Autumn	7.5
PHYS70013	Atmospheric Physics	Elective	F	Spring	7.5
PHYS70007	Optical Communications Physics	Elective	F	Autumn	5
				Credit Total	60/62.5

* 'Group' refers to module grouping (e.g. a group of electives from which one/two module(s) must be chosen).

** All credits refer to ECTS.

[2] If you choose to take Quantum Field Theory you must normally have completed and passed Advanced Classical Physics and Foundations of Quantum Mechanics in your third year.

[3] If you choose to take Quantum Information you must normally have completed and passed Foundations of Quantum Mechanics in your third year.

[4] If you choose to take Unification you must normally have completed and passed Advanced Classical Physics and in your third year and take Quantum Field Theory in your third year.

Progression and Classification

Progression
In order to progress to the next level of study, you must have passed all modules (normally equivalent to 60 ECTS) in the current level of study either at first attempt, at resit or by a compensated pass.

Year One
You must:

- achieve an aggregate mark of at least 40.00% including where modules have been compensated.

Year Two
You must:

- achieve an aggregate mark of at least 40.00% including where modules have been compensated.

Year Three
You must:

- achieve an aggregate mark of at least 40.00% including where modules have been compensated.

Classification
The marks from modules in each year contribute towards the final degree classification.

In order to be considered for an award, you must have achieved the minimum number of credits at the required levels prescribed for that award and met any programme specific requirements as set out in the Programme Specification.

Your classification will be determined through:

- aggregate module marks for all modules,
- year weightings.

This is known as the Programme Overall Weighted Average.

For this award, Year One is weighted at 7.50%, Year Two at 35.00% and Year Three at 57.50%.

The university sets the class of undergraduate degree that may be awarded as follows:

- First 70.00% or above for the average weighted module results
- Upper Second 60.00% or above for the average weighted module results
- Lower Second 50.00% or above for the average weighted module results
- Third 40.00% or above for the average weighted module results

Please find the full Academic Regulations at www.imperial.ac.uk/about/governance/academic-governance/regulations/. Please follow the prompts to find the set of regulations relevant to your programme of study.

Programme Specific Regulations

You are required to take a total of 60 or 62.5 ECTS in each of Years 2 and 3.

Supporting Information
The Programme Handbook is available at: www.imperial.ac.uk/physics/students/current-students/undergraduates/physics-student-handbook/
The Module Handbook is available at: www.imperial.ac.uk/physics/students/current-students/undergraduate-and-masters-degree-courses-list/
Imperial's entry requirements for postgraduate programmes can be found at: www.imperial.ac.uk/study/pg/apply/requirements
Imperial's Quality & Enhancement Framework is available at: www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance
Imperial's Academic and Examination Regulations can be found at: www.imperial.ac.uk/about/governance/academic-governance/regulations
Imperial College London 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 Imperial's Centenary, 8th July 2007, established Imperial as a University with the name and style of "The Imperial College of Science, Technology and Medicine". www.imperial.ac.uk/admin-services/secretariat/college-governance/charters/
Imperial College London is regulated by the Office for Students (OfS) www.officeforstudents.org.uk/advice-and-guidance/the-register/
This document provides a definitive record of the main features of the programme and the learning outcomes that you may reasonably be expected to achieve and demonstrate if you take full advantage of the learning opportunities provided. This programme specification is primarily intended as a reference point for prospective and current students, academic and support staff involved in delivering the programme and enabling student development and achievement, for its assessment by internal and external examiners, and in subsequent monitoring and review.