Programme Information		
Programme Title	Programme Code	HECoS Code
Physics Physics with Extended Research Physics with Nanophotonics Physics with Quantum Dynamics	F3U1 F3U1R F3U10 F3V1	For Registry Use Only

Award	Length of Study	Mode of Study	Entry Point(s)	Total Credits	
				ECTS	CATS
MSc	1 year (12 months)	Full-time	Annually in October	90	180
MSc – F3U1R	2 academic years* (18 months)	Full-time	Annually in October	120	240
PG Diploma	12 months	Full-time	**	60	120
PG Certificate	9 months	Full-time	**	30	60

*For the MSc with Extended Research

**The PG Diploma and PG Certificate are exit awards and are not available for entry. They may be awarded as exit awards at the discretion of the Board of Examiners. A PG Diploma is not available for the MSc with Extended Research stream because there is no summer project for that stream. A PG Certificate would be available for the MSc w/ ER if a student needed to withdraw after the first year due to exceptional circumstances. All students must apply to and join the MSc.

Ownership			
Awarding Institution	Imperial College London	Faculty	Faculty of 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		N/A	
FHEQ Level		7	
EHEA Level		2nd Cycle	
External Accreditor(s) (if applicable)			
External Accreditor 1:	N/A		
Accreditation received:	N/a	Accreditation renewal:	n/a
Collaborative Provision			

Collaborative partner	Collaboration type	Agreement effective date	Agreement expiry date
N/A	N/A	N/A	N/A

Specification Details	
Programme Lead	Professor Stephen Warren
Student cohorts covered by specification	2022-23 entry
Date of introduction of programme	October 08
Date of programme specification/revision	October 22

Programme Overview

The MSc programme consists of four streams, each of which has its own set of compulsory and core modules, and a selection of elective modules. The streams are:

- MSc Physics [PH] (1 calendar year / 12 months, full-time)
- MSc Physics with Nanophotonics [NP] (1 calendar year / 12 months, full-time)
- MSc Physics with Quantum Dynamics [QD] (1 calendar year / 12 months, full-time)
- MSc Physics with Extended Research [ER] (2 academic years / 18 months, full-time)

All streams include a compulsory lecture-based module (Mathematical Methods for Physicists) that provides a key grounding in essential mathematical techniques and skills that are important to all areas of physics, and a practical Research Computing Skills module that provides a grounding in computing skills that are commonly used by practising physicists.

The PH, ER and NP streams additionally include a compulsory lecture-based module (Advanced Classical Physics) that provides a key grounding in essential physical concepts and skills that underpin classical physics.

Furthermore, the NP and QD streams include lecture-based compulsory modules that cover areas of importance in Nanophotonics and Quantum Dynamics, respectively.

The Extended Research stream offers the chance to undertake a longer, and therefore more in-depth, research project. This could be particularly advantageous for students who wish to start PhD research after completing the MSc.

Students on all streams may choose from a wide range of elective modules offered by the Department that cover advanced topics at the forefront of current physics research and practice. For the 1 year MSc programmes (PH, NP, QD), to give students the widest possible choice of electives, students may choose a combination of electives that leads to either a total of 90 ECTS or 92.5 ECTS overall for the programme. For the 2 year (18 month) ER programme, students must accumulate a total of 120 ECTS.

Students in all streams also undertake a self-study project in an area of their choice to gain deeper knowledge into a particular area of physics. For those on a 1 year (12 month) programme, your studies culminate with a four-month full-time MSc Research Project which is usually carried out in one of our academic research groups but may be with one of our industrial partners or, where appropriate arrangements can be made, abroad. We expect most projects will be undertaken in pairs, with individual final project theses. For those on the 2 year (18 month) Physics with Extended Research programme, you undertake nine months of full-time project work in year 2 of the programme.

Graduates of this course are well qualified to enter a PhD programme, with many moving on to doctoral studies at leading universities around the world. Many also find employment in a variety of careers in government or industry. Graduates of the NP stream will be particularly well-equipped for doctoral research in plasmonics, metamaterials, or in general nanoscale photonics, and those of the QD stream will be particularly well-equipped for doctoral research in atomic physics, quantum photonics, quantum information, or in general quantum physics.

The tables below give a summary overview of the programme structure for each stream. The shaded rows indicate modules that are common to more than one stream: green for all streams; orange for the PH, NP and QD streams; and blue for the PH, NP and ER streams.

MSc Physics [PH]			Term	ECTS
PHYS60005	Advanced Classical Physics	Compulsory	1	7.5
PHYS70051	Mathematical Methods for Physicists	Compulsory	1	7.5
PHYS70052	Research Computing Skills for Physicists	Compulsory	1, 2	7.5
PHYS70053	Self-Study Project	Compulsory	1 or 2	7.5
PHYS70054	MSc Research Project	Core	3, summer	30
	Elective modules: either 4 x 7.5 ECTS; or 3 x 7.5 ECTS + 2 x 5 ECTS	Elective	1, 2	30 or 32.5
			Credit total	**90 or 92.5**

MSc Physics with Nanophotonics [NP]			Term	ECTS
PHYS60005	Advanced Classical Physics	Compulsory	1	7.5
PHYS70051	Mathematical Methods for Physicists	Compulsory	1	7.5
PHYS70052	Research Computing Skills for Physicists	Compulsory	1, 2	7.5
PHYS70053	Self-Study Project	Compulsory	1 or 2	7.5
PHYS70054	MSc Research Project	Core	3, summer	30
PHYS70024	Imaging	Compulsory	1	5
PHYS70005	Introduction to Plasmonics and Metamaterials	Compulsory	1	7.5
PHYS70030	Advanced Topics in Nanophotonics	Compulsory	2	7,5
	Elective modules: either 2 x 5 ECTS; or 1 x 7.5 ECTS + 1 x 5 ECTS	Elective	1, 2	10 or 12.5
			Credit total	**90** or **92.5**

MSc Physics with Quantum Dynamics [QD]			Term	ECTS
PHYS70051	Mathematical Methods for Physicists	Compulsory	1	7.5
PHYS70052	Research Computing Skills for Physicists	Compulsory	1, 2	7.5
PHYS70053	Self-Study Project	Compulsory	2	7.5
PHYS70054	MSc Research Project	Core	3, summer	30
PHYS70009	Quantum Information	Compulsory	1	7.5
PHYS70010	Quantum Optics	Compulsory	1	7.5

PHYS70057	Quantum Systems 1: Cold Atomic Systems	Compulsory	1	5
PHYS70058	Quantum Systems 2: Hybrid Quantum Systems	Compulsory	2	7.5
	Elective modules: either 2 x 5 ECTS; or 1 x 7.5 ECTS + 1 x 5 ECTS	Elective	1, 2	10 or 12.5
			Credit total	**90** or **92.5**

MSc Physics with Extended Research [ER]			Term	ECTS
PHYS60005	Advanced Classical Physics	Compulsory	1	7.5
PHYS70051	Mathematical Methods for Physicists	Compulsory	1	7.5
PHYS70052	Research Computing Skills for Physicists	Compulsory	1, 2	7.5
PHYS70053	Self-Study Project	Compulsory	1 or 2	7.5
PHYS70056	MSc Extended Research Literature Review (year 2)	Core	1, 2	15
PHYS70055	MSc Extended Research Project (year 2)	Core	1, 2, 3	45
	Elective modules: either 4 x 7.5 ECTS; or 2 x 7.5 ECTS + 3 x 5 ECTS	Elective	1, 2	30
			Credit total	**120**

Notes:

- We expect most students will finish with 90ECTS. However, it is possible to finish with 92.5 ECTS if a combination of higher weighted electives is chosen. This involves a greater workload and should be discussed with your Mentor or the Programme Director before committing to this option.
- Other electives may be substituted for compulsory modules if the learning objectives of those modules have been met in a previous degree.
- Electives that are offered by other departments or other MSc programmes may not be available due to capacity constraints.
- Advanced Classical Physics is a Level 6 module of the Physics undergraduate degree programme.
- Imaging and Advanced Topics in Nanophotonics are Level 7 modules of the MSc Optics & Photonics programme.
- Introduction to Plasmonics and Metamaterials, Quantum Information and Quantum Optics are Level 7 modules of the MSci Physics undergraduate degree programme.

Learning Outcomes

On successful completion of the **MSc Physics (all streams)**, students will be able to:

- demonstrate an understanding of selected areas of physics at the frontiers of knowledge, beyond the undergraduate level;
- critically select and apply appropriate advanced mathematical methods to problems in physics;
- critically select and apply appropriate computing research skills and methodology to problems in physics;
- communicate effectively, both in writing and orally, to specialised and non-specialised audiences.

Additionally:

MSc Physics, **MSc Physics with Nanophotonics** and **MSc Physics with Quantum Dynamics** students will be able to:

- design, plan and carry out a research project, analyse the results and formulate new knowledge in selected areas of physics appropriate to their stream of the programme.

- critically examine the scientific literature to design an experimental, theoretical and/or computational investigation that extends current knowledge in areas of physics appropriate to their stream of the programme.

MSc in Physics with Extended Research, students will be able to:

- describe at an advanced level the state of the art of research in a particular field of physics.
- design, plan and carry out an extended research project, analyse the results and formulate new knowledge that can be applied to a field of physics of current research interest.
- critically examine the scientific literature to design an experimental, theoretical and/or computational investigation that extends current knowledge in the field.
- critically review and explain their research in detail to a specialist audience

Exit awards

Students who graduate with a **PG Certificate** will be able to:

- demonstrate an understanding of selected areas of physics at an advanced level.
- select and apply appropriate advanced mathematical methods to problems in physics;
- apply computing research skills and methodology to problems in physics;

Students who graduate with a **PG Diploma** will in addition be able to:

- design, plan and carry out a research project, analyse the results and formulate new knowledge in an area of physics.

Entry Requirements	
Academic Requirement	Normally a First class (1st) UK Bachelor's Degree with Honours in Physics. Other scientific disciplines (e.g. Engineering, Chemistry, Mathematics) may be considered (or a comparable qualification recognised by the College).
Non-academic Requirements	N/A
English Language Requirement	Standard requirement (PG) Please check for other Accepted English Qualifications
Admissions Test/Interview	N/A

The programme's competency standards documents can be found at: https://www.imperial.ac.uk/media/imperial-college/faculty-of-natural-sciences/department-of-physics/public/students/current-students/pgt/FoNS-Competence-Standards---Physics-PGT.pdf

Learning & Teaching Approach

Learning and Teaching Delivery Methods

The programme is delivered using a range of methods including lectures, problem classes, hands-on computational classes, directed supervision on projects and, in some modules (depending on the stream of the programme and the electives chosen) practical laboratory work. Research Computing Skills is delivered as a credit/no-credit module consisting of lectures, exercises, practical work, and group work. This module has a significant component of peer assessment.

Lectures are accompanied by supporting material that may include notes, problem sheets and solutions and other resources. Learning is guided through problem classes and regular problem sheets. Lectures may be 'flipped', where recorded material is provided in advance of classwork and group exercises. All of the material lecturers provide is available online via Blackboard and recordings are made available via Panopto. Lecturers may provide office hours as informal drop-in question and answer sessions for students.

Project work is assessed individually, but you may be supervised in small groups with students on the same or similar topics with whom you may collaborate. Project work associated with the programme is as follows:

1. Students on all streams complete a Self-Study Project, which requires you to take a topic, subject area or research technique (which is normally selected from a list that is provided) and conduct a review of the scientific literature. Each topic has a member of staff assigned as the project supervisor and you are encouraged to meet regularly to discuss your progress and plans.

2. Students on the MSc Physics, MSc Physics with Nanophotonics and MSc Physics with Quantum Dynamics streams undertake a full-time 4-month MSc Research Project after the examinations in term 3 and over the summer.

3. Students on the MSc Physics with Extended Research, after the summer examinations and the end of term 3 of the first year, return in October to work full-time on their MSc Extended Literature Review and MSc Extended Research Project through terms 1, 2 and 3 of the second year of the programme.

The topic of the MSc Research Project or the MSc Extended Research Project and Literature Review (as appropriate for the stream) is normally chosen from a list of projects offered by staff, with input from students. Each project is supervised by a member of staff. Normally you will meet your project supervisor regularly during the course of your project.

A key feature of all streams of the programme is the wide choice of elective modules that students are able to choose from.

Overall Workload

Your overall workload consists of scheduled contact time, project work and independent learning. While your actual contact hours may vary according to the elective 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 2,250 to 2,312.5 hours for the 1 year (12 month) MSc streams (90-92.5 ECTS) and 3,000 hours for the 2 year (18 month) MSc with Extended Research stream (120 ECTS).

For the 1 year (12 months) MSc streams, typically 50% of your time will be associated with taught modules and 50% on project-related activities. The latter includes the Self-Study Project, Research Computing Skills, as well as the MSc Research Project. For the 2 year (18 month) Physics with Extended Research stream, in the first year typically 75% of your time will be associated with taught modules and 25% on project-related activities, while the second year is 100% project work that consists of two parts: an MSc Extended Research Literature Review in which you will acquire a broader overview of your research topic and an MSc Extended Research Project in which you will pursue original research.

Assessment Strategy

Assessment Methods

The assessment method, or combination of methods, is determined by the nature of the module, and may include continuous assessment (eg, assessed problem sheets), written examinations, written reports, oral presentations, poster presentations, a dissertation. Written exams take place in January and in term 3. Coursework is continuous through terms 1 and 2.

In terms of project assessment, the Self-Study Project is assessed via an oral presentation and a written report. For the 1 year (12 month) streams, the MSc Research Project is assessed through a combination of continuous progress assessment, a poster presentation, a written literature review and project plan, and a written dissertation. For the 2 year (18 month) stream, the MSc Extended Research Literature Review is assessed through a written report and a written project plan and the MSc Research Project is assessed through a combination of continuous progress assessment, an oral presentation, an oral examination and a written dissertation.

In Research Computing Skills students will provide peer-to-peer formative feedback. This will consist of certifying that programming exercises are complete and working to expectations, with comments on techniques and implementation. Staff will mark the group project component of this module to ensure that the learning outcomes of the module have been satisfied.

All modules will be weighted by their ECTS value in order to compute the final degree classification. The precise breakdown of assessment will vary depending on the stream and choice of elective modules. For the 12 month programmes, indicative values are:

Coursework: 8.3%
Written examinations: 50%
Written and oral reports relating to project work: 41.6%

For the MSc with Extended Research indicative values are:

Coursework: 6.3%
Written examinations: 37.5%
Written and oral reports and examinations relating to project work: 56.3%

Academic Feedback Policy
Feedback will be provided on assessed problem sheets, by comments on written work, and by written comments on oral/poster presentations. Examples of feedback mechanisms include: Oral feedback to a group may be provided during or after lectures Oral feedback and guidance while you are working on practical computing elements Personal feedback may follow from discussion with lecturers after lectures or during office hours Personal feedback from your project supervisors Personal feedback on your oral/poster presentations Interactive feedback may follow from peer group discussion Written feedback may take the form of solutions to coursework or writing on formal reports Written and oral feedback on your research project at progress milestones, eg, the literature review and project plan. Other aspects of feedback come from taking time to think about what you do or do not understand well, and from other discussions with teaching staff, lab demonstrators, project supervisors and your classmates. For formal summative assessment of coursework the College'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. The College'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
The College's Policy on Re-sits is available at: 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: www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/

Additional Programme Costs		
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[1]

FHEQ Level 6

- Students may take a total of **up to two** modules at Level 6 from the Physics undergraduate programme.
- Where a module is specific to a particular stream, this is indicated (PH: Physics stream; ER: Extended Research stream; NP: Nanophotonics stream; QD: Quantum Dynamics stream).

Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits
PHYS60005	Advanced Classical Physics	PH: Compulsory ER: Compulsory NP: Compulsory QD: Elective		1	7.5
	Other elective modules from the Physics undergraduate programme	Elective		1, 2	5 or 7.5
				Credit Total	

FHEQ Level 7

- Students study all core and compulsory modules in their stream and fill the balance of their programme with elective modules.
- Unless otherwise indicated, modules labelled as core/compulsory for a given stream are elective for other streams.
- Where a module is specific to a particular stream, this is indicated (PH: Physics stream; ER: Extended Research stream; NP: Nanophotonics stream; QD: Quantum Dynamics stream).
- Group A modules belong to this programme; Group B modules to the MSc Optics and Photonics programme; and Group C modules to the Physics undergraduate programme.

Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits
PHYS70051	Mathematical Methods for Physicists	Compulsory	A	1	7.5
PHYS70052	Research Computing Skills	Compulsory	A	1, 2	7.5
PHYS70053	Self-Study Project	Compulsory	A	1 or 2	7.5
PHYS70054	MSc Research Project	Core (PH, NP & QD only)	A	3, summer	30
PHYS70055	MSc Extended Research Project	Core (ER only)	A	1, 2, 3 (yr. 2)	45
PHYS70056	MSc Extended Research Literature Review	Core (ER only)	A	1 (yr. 2)	15
PHYS70024	Imaging	NP: Compulsory	B	1	5
PHYS70005	Introduction to Plasmonics and Metamaterials	NP: Compulsory	C	1	7.5
PHYS70030	Advanced Topics in Nanophotonics	NP: Compulsory	B	2	7.5

[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 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 to present an element of choice in the curriculum and from which students are able to select. Elective modules can be compensated.

PHYS70057	Quantum Systems 1: Cold Atomic Systems	QD: Compulsory	A	1	5
PHYS70058	Quantum Systems 2: Hybrid Quantum Systems	QD: Compulsory	A	2	7.5
PHYS70059	Advanced Quantum Information	QD: Elective	A	2	5
PHYS70009	Quantum Information	QD: Compulsory	C	1	7.5
PHYS70010	Quantum Optics	QD: Compulsory	C	1	7.5
	Other elective modules from the Physics undergraduate programme and other Masters-level programmes in the Department of Physics	Elective		1, 2	5 or 7.5
				Credit Total	

Progression and Classification

Progression onto year 2 of the MSc with Extended Research
Students must pass all modules from year one to progress to the second year of the MSc Physics with Extended Research stream. At the discretion of the programme director, a student may carry a small number of resits into the second year.

Award and Classification for Postgraduate Students
Degree classification is based on assessment results from each of the modules you complete. These results are combined, weighted by ECTS relative to the total ECTS credits taken (either 90 or 92.5 ECTS for the MSc Physics, MSc Physics with Nanophotonics and MSc Physics with Quantum Dynamics streams, or 120 ECTS for the MSc with Extended Research stream), to produce the overall weighted average which is used for the purpose of degree classification.

Award of an MSc degree for the MSc Physics, MSc Physics with Nanophotonics and MSc Physics with Quantum Dynamics
To qualify for the award of an MSc a student must have:

1. accumulated credit to the value of no fewer than 90 ECTS, of which at least 75 ECTS are at level 7 or above, with no more than 15 ECTS at Level 6;
2. and no more than 15 ECTS as a Compensated Pass;

Award of an MSc degree for the MSc Physics with Extended Research
To qualify for the award of an MSc a student must have:

1. accumulated credit to the value of no fewer than 120 ECTS, of which at least 75 are at Level 7 or above, with no more than 15 ECTS at Level 6;
2. and no more than 15 ECTS as a Compensated Pass;

Classification of Postgraduate Taught Awards
The College sets the class of Degree that may be awarded as follows:

1. Distinction:
    a. The student has achieved an overall weighted average of 70.00% or above across the programme.
    b. Students must normally achieve a distinction (70.00%) mark in the MSc Research Project or MSc Extended Research module in order to be awarded a distinction.

2. Merit:
    a. The student has achieved an overall weighted average of above 60.00% but less than 70.00%.
    b. Students must normally achieve a merit (60.00%) mark in the MSc Research Project or MSc Extended Research Project module in order to be awarded a merit.

3. Pass: The student has achieved an overall weighted average of 50.00% but less than 60.00%.

Exit degrees:

Award of a Postgraduate Certificate (PG Cert)
To qualify for the award of a Postgraduate Certificate a student must have a minimum of 30 ECTS at Level 7 (this may include a maximum of 10 ECTS from Level 6 where this is approved as part of the award). These credits must include Research Computing Skills and Mathematical Methods for Physicists.

Award of a Postgraduate Diploma (PG Dip)
To qualify for the award of a postgraduate diploma a student must have passed modules to the value of no fewer than 60 ECTS at Level 7 (this may include a maximum of 15 ECTS from Level 6 where this is approved as part of the award). These credits must include Research Computing Skills, Mathematical Methods for Physicists and the MSc Research Project, and no more than 10 ECTS as a Compensated Pass.

Exit degrees are not available for the MSc Physics with Extended Research.

Programme Specific Regulations

N/A

Supporting Information
The Programme Handbook is available at: www.imperial.ac.uk/media/imperial-college/faculty-of-natural-sciences/department-of-physics/public/students/current-students/pgt/Physics-MSc-Handbook-2021-22.pdf
The Module Handbook is available at: **TBA**
The College's entry requirements for postgraduate programmes can be found at: www.imperial.ac.uk/study/pg/apply/requirements
The College's Quality & Enhancement Framework is available at: www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance
The College's Academic and Examination Regulations can be found at: www.imperial.ac.uk/about/governance/academic-governance/regulations
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". 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 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 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.

Modifications			
Description	**Approved**	**Date**	**Paper Reference**
Curriculum Review	Programmes Committee	25 January 2022	PC.2021.37