

**MSc Physics with Shock 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 with Shock Physics			
Award(s)	MSc			
Programme Code	F3U1A			
Associateship	None			
Awarding Institution	Imperial College London			
Teaching Institution	Imperial College London			
Faculty	Faculty of Natural Sciences			
Department	Department of Physics			
Mode and Period of Study	1 academic year, full-time			
Cohort Entry Points	Annually in October			
Relevant <a href="#">QAA Benchmark Statement(s)</a> and/or other external reference points	<a href="#">Master's Awards in Physics, Astronomy and Astrophysics</a>			
Total Credits	ECTS:	90-94	CATS:	180-188
<a href="#">FHEQ Level</a>	Level 7			
<a href="#">EHEA Level</a>	2 <sup>nd</sup> cycle			
External Accrator(s)	None			
<b>Specification Details</b>				
Student cohorts covered by specification	2016/17 entry			
Person responsible for the specification	Dr William Proud			
Date of introduction of programme	October 2013			
Date of programme specification/revision	March 2017			

## Description of Programme Contents

Shock physics focuses on the understanding of what happens to matter under extreme conditions. This research can be applied in many ways, including:

- Analysing the effect of meteorite impacts on planets, spacecraft and satellites
- Understanding how tsunamis are formed
- Understanding the high pressure conditions that occur at the core of planets

This course explores the response of a wide range of materials, from rock to plasma, when subjected to rapid or high pressure loading. This area is important for a number of applications, such as:

- Preventing impact damage to transportation vehicles
- Petrochemical and other offshore platforms
- Astrophysics and studies into the internal conditions of nuclear energy reactors

You will be trained in techniques that are of value to potential industrial employers, government agencies and other organisations.

## Learning Outcomes

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](http://www.imperial.ac.uk/students/academic-support/graduate-attributes)

MSc in Physics with Shock Physics graduates will have:

- Undertaken an intellectually challenging and stimulating degree programme in shock physics;
- Extended their knowledge of advanced mathematical methods;
- Been given the opportunity to embark on a major, individual research project, with potential for scientific publication;
- Been given training in appropriate theoretical, computational and experimental research methods;
- Developed general skills as regards to written and oral communication, both to scientific and to more general audiences;
- Been equipped for doctoral research in shock physics and for careers where shock physics is an enabling discipline.

## Entry Requirements

Academic Requirement	First class (1st) Honours degree in physics. Other scientific disciplines (e.g. engineering, chemistry, mathematics) may be considered.
Non-academic Requirements	None
English Language Requirement	<a href="#">Standard requirement</a>

The programme's competency standards document can be found at: <http://www.imperial.ac.uk/physics/students/current-students/taught-postgraduates/>

<b>Learning &amp; Teaching Strategy</b>	
Scheduled Learning & Teaching Methods	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Problem classes</li> <li>• Practical work</li> <li>• E-learning</li> <li>• Tutorials</li> <li>• Practical classes</li> </ul>
E-learning & Blended Learning Methods	<ul style="list-style-type: none"> <li>• Blackboard</li> <li>• Panopto</li> </ul>
Project and Placement Learning Methods	<ul style="list-style-type: none"> <li>• Self-study project</li> </ul>
<b>Assessment Strategy</b>	
Assessment Methods	<ul style="list-style-type: none"> <li>• Examinations</li> <li>• Problem sheets</li> <li>• Small projects</li> <li>• Written report</li> <li>• Oral presentation</li> <li>• Report</li> <li>• Viva</li> <li>• Poster</li> <li>• Dissertation</li> </ul>
<b>Academic Feedback Policy</b>	
<p>The feedback policy will follow the guidelines of the Department of Physics, where written feedback should be provided to the student within two weeks of the work being submitted.</p> <p>Many of the lecture modules have classworks, which allow students to work through problems under the guidance of the lecturer.</p> <p>The practical work is continually assessed.</p>	
<b>Re-sit Policy</b>	
<p>The College's Policy on Re-sits is available at: <a href="http://www.imperial.ac.uk/registry/exams/resit">www.imperial.ac.uk/registry/exams/resit</a></p>	
<b>Mitigating Circumstances Policy</b>	
<p>The College's Policy on Mitigating Circumstances is available at: <a href="http://www.imperial.ac.uk/registry/exams">www.imperial.ac.uk/registry/exams</a></p>	

Programme Structure					
Full-time	Pre-session	Autumn Term	Spring Term	Summer Term	Summer Vacation
Core Modules (Lectures)	0	3	2	0	0
Core Modules (Practical)	0	1	1	0	0
Elective Modules	0	2		0	0
Projects	0	1	0	1	0
Assessment Dates & Deadlines					
Written Examinations	May. Modules taken outside the MSci programme may have examinations at other times.				
Coursework Assessments	Continuous				
Project Deadlines	January, September				
Practical Assessments	Continuous				
Assessment Structure					
Marking Scheme					
<p>The MSc consists of two elements:</p> <ul style="list-style-type: none"> <li>• Taught modules, accounting for 52% of the total programme mark, and;</li> <li>• Practical work, accounting for 48% of the total programme mark.</li> </ul> <p>The marking scheme for the elements and components will follow the 'Regulations for the Examinations of Masters Degrees'</p> <p><b>Final Degree Classifications</b></p> <p><b>Pass - a candidate must:</b></p> <ul style="list-style-type: none"> <li>• Achieve an aggregate mark of 50% or higher in each element;</li> <li>• Pass each component with a mark of 40% or higher.</li> </ul> <p><b>Merit - a candidate must:</b></p> <ul style="list-style-type: none"> <li>• Achieve an aggregate mark of <math>\geq 60\%</math> and;</li> <li>• A mark of <math>\geq 60\%</math> for at least two of the elements and;</li> <li>• An aggregate mark of <math>\geq 50\%</math> for the other element.</li> </ul> <p><b>Distinction - a candidate must:</b></p> <ul style="list-style-type: none"> <li>• Achieve an aggregate mark of <math>\geq 70\%</math> and;</li> <li>• A mark of <math>\geq 70\%</math> for at least two of the elements and;</li> <li>• An aggregate mark of <math>\geq 60\%</math> for the other element.</li> </ul>					

<b>Module Weightings</b>		
<b>Element (% Weighting)</b>	<b>Module</b>	<b>% Module Weighting</b>
<b>Taught (52%)</b>	Advanced Classical Physics*	15.38%
	Mathematical Methods*	15.38%
	Introduction to Shock Physics	15.38%
	Shock Waves in Context	15.38%
	Fluid Dynamics	7.69%
	Elective modules to the value of 12 ECTS	7.69% or 15.38% each**
<b>Practical (48%)</b>	Research Skills	12.5%
	Self-Study Project	12.5%
	Dissertation	75%

\*These modules may be replaced if the material has already been covered at undergraduate level.

\*\*Module weightings are dependent on the size of the module e.g. modules worth 3 ECTS are weighted at 7.69%. Modules worth 6 or 8 ECTS are weighted at 15.38%.

Indicative Module List											
Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Written Exam	% Course- work	% Practical	FHEQ Level	ECTS
PH3-ACP	Advanced Classical Physics	Core	27	123	0	150	100%	0%	0%	6	6
PH9-TMTM	Mathematical Methods	Core	32	168	0	200	80%	20%	0%	7	8
PH9-SFSP	Introduction to Shock Physics	Core	30	120	0	150	100%	0%	0%	7	6
PH9-SCTSS	Shock Waves in Context	Core	30	120	0	150	100%	0%	0%	7	6
PH3-FD	Fluid Dynamics	Core	14	61	0	75	100%	0%	0%	6	3
PH9-GRST	Research Skills	Core	27	123	0	150	0%	100%	0%	7	6
PH9-GSSP	Self-Study project	Core	0	150	0	150	0%	80%	20%	7	6
PH9-GPROJ	Project	Core	0	900	0	900	0%	92%	8%	7	36
PO3.6	Astrophysics	Elective	47	103	0	150	100%	0%	0%	6	6
PT3.5	Computational Physics	Elective	58	92	0	150	40%	60%	0%	6	6
PT3.1	Foundations of Quantum Mechanics	Elective	57	93	0	150	100%	0%	0%	6	6
PT3.2	Group Theory	Elective	57	93	0	150	100%	0%	0%	6	6
P3.11	Light & Matter	Elective	53	97	0	150	100%	0%	0%	6	6
PT3.4	Statistical Mechanics	Elective	57	93	0	150	100%	0%	0%	6	6

Indicative Module List											
Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Written Exam	% Course- work	% Practical	FHEQ Level	ECTS
PT3.6	Complexity & Networks	Elective	57	93	0	150	20%	80%	0%	6	6
PO3.3a	Lasers	Elective	28.5	46.5	0	75	100%	0%	0%	6	3
PO3.3b	Imaging and Biophotonics	Elective	28.5	46.5	0	75	100%	0%	0%	6	3
PO3.7a	Medical Imaging: X-Rays and Ultrasound	Elective	23.5	51.5	0	75	100%	0%	0%	6	3
PO3.7b	Medical Imaging: Nuclear Diagnostics & MRI	Elective	23.5	51.5	0	75	100%	0%	0%	6	3
PO3.2	Plasma Physics	Elective	47	103	0	150	100%	0%	0%	6	6
PO3.5	Principles of Instrumentation	Elective	58	92	0	150	100%	0%	0%	6	6
PO4.10	Nanotechnology in Consumer Electronics	Elective	23.5	51.5	0	75	100%	0%	0%	7	3
PT4.2	General Relativity	Elective	57	93	0	150	100%	0%	0%	7	6
PO4.9	Advanced Hydrodynamics	Elective	23.5	51.5	0	75	100%	0%	0%	7	3
PO4.4a	Optical Communications	Elective	23.5	51.5	0	75	100%	0%	0%	7	3
PO4.4b	Information Theory	Elective	23.5	51.5	0	75	100%	0%	0%	7	3
PO4.9	Plasmonics & Metamaterials	Elective	47	103	0	150	100%	0%	0%	7	6
PT4.4	Quantum Field Theory	Elective	57	143	0	200	100%	0%	0%	7	8

Indicative Module List											
Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Written Exam	% Course- work	% Practical	FHEQ Level	ECTS
PT4.8	Quantum Information	Elective	57	93	0	150	100%	0%	0%	7	6
PO4.6	Quantum Optics	Elective	47	103	0	150	100%	0%	0%	7	6
PT4.6	Unification	Elective	57	143	0	200	100%	0%	0%	7	8
PT4.1	Advanced Particle Physics	Elective	57	93	0	150	100%	0%	0%	7	6
PO4.1	Atmospheric Physics	Elective	57	93	0	150	100%	0%	0%	7	6
BE4-MCNS	Computational Neuroscience	Elective	57	93	0	150	100%	0%	0%	7	6
PO4.5	Cosmology	Elective	57	93	0	150	100%	0%	0%	7	6
PH4-LT	Laser Technology	Elective	47	103	0	150	100%	0%	0%	7	6
PT4.5	Quantum Theory of Matter	Elective	57	93	0	150	100%	0%	0%	7	6
PO4.3	Space Physics	Elective	47	103	0	150	100%	0%	0%	7	6

**Please note that additional modules from outside the department as well as a range of specialist modules within the Department of Physics may be taken at the discretion of the Programme Director.**



## Supporting Information

The Programme Handbook is available at: <http://www.imperial.ac.uk/natural-sciences/departments/physics/students/current-students/taught-postgraduates/>

The Module Handbook is available at: <http://www.imperial.ac.uk/natural-sciences/departments/physics/students/current-students/taught-postgraduates/>

The College's entry requirements for postgraduate programmes can be found at: [www.imperial.ac.uk/study/pg/apply/requirements](http://www.imperial.ac.uk/study/pg/apply/requirements)

The College's Quality & Enhancement Framework is available at: [www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance](http://www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance)

The College's Academic and Examination Regulations can be found at: <http://www3.imperial.ac.uk/registry/proceduresandregulations/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".  
<http://www.imperial.ac.uk/admin-services/secretariat/college-governance/charters-statutes-ordinances-and-regulations/>

Imperial College London is regulated by the Higher Education Funding Council for England (HEFCE) <http://www.hefce.ac.uk/reg/of/>