

Programme Title: MSc Particle Physics



Programme Specification (PG)

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| Awarding body / institution: | Queen Mary University of London |
| Teaching institution: | Queen Mary University of London |
| Name of final award and programme title: | MSc Particle Physics |
| Name of interim award(s): | |
| Duration of study / period of registration: | 1 calendar year |
| QMUL programme code(s): | F3S3 |
| QAA Benchmark Group: | |
| FHEQ Level of Award: | Level 7 |
| Programme accredited by: | |
| Date Programme Specification approved: | |
| Responsible School / Institute: | School of Physics and Astronomy |

Schools / Institutes which will also be involved in teaching part of the programme:

Collaborative institution(s) / organisation(s) involved in delivering the programme:

University College London, Kings College London and Royal Holloway, University of London

Disclaimer: The availability of modules offered by KCL, UCL and RHUL are outside of QMUL's control and we cannot guarantee that all modules will be running each year.

Programme outline

This is a one calendar year full-time MSc in Physics consisting of three streams: Theoretical Physics, Particle Physics and Condensed matter Physics. Although the streams are mainly distinguished by the 60 credit MSc project, there are also compulsory modules specified for each stream (see Programme structure section).

Aims of the programme

The purpose of this programme is manifold: To allow students holding a (generic, e.g. BSc Physics) first degree to specialise in a particular area of Physics (particle physics in the case of this stream). To train graduates in research skills suitable for both further (post-graduate research) studies and employment (e.g. industrial research). To enable students who did not gain a sufficiently

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high first degree classification (e.g. a second class degree) to continue with postgraduate studies.

What will you be expected to achieve?

Students successfully completing the programme will have a deep knowledge of advanced topics in physics, including a solid understanding of Quantum Field Theory and its use for describing and interpreting particle physics experiments. The programme includes a one-term long project, supervised by one of the researchers in our School, that students can choose among a wide range of topics of current interest in particle physics. This MSc programme will prepare a student for a PhD in particle physics, but also more generally, for research and employment in fields that require excellent analytic skills and the ability to model complex systems.

| Academic Content: | |
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| A 1 | Know the fundamental laws and physical principles, along with their applications, in a specific area of physics. |
| A 2 | Manage their own research, making use of journal articles and other primary sources. |
| A 3 | Communicate complex scientific ideas, concisely, accurately and informatively. |
| A 4 | Use mathematical analysis to model physical behaviour and interpret the mathematical descriptions of physical phenomena. |

| Disciplinary Skills - able to: | |
|--------------------------------|--|
| B 1 | To solve advanced problems in physics using appropriate mathematical tools (to order of magnitude or more precisely as appropriate). |
| B 2 | To plan and execute an investigation and to critically analyse the results, drawing valid conclusions. |
| B 3 | To prepare a detailed technical report on their project and compare their results with published data ,expected outcomes or theoretical predictions. |
| B 4 | To identify relevant physical principles and translate problems into mathematical statements. |

| Attributes: | |
|-------------|---|
| C 1 | Acquire and apply knowledge in a rigorous way |
| C 2 | Explain and argue clearly and concisely |
| C 3 | Connect ideas and information within their field of study |

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| C4 | Critically evaluate the reliability of different sources of information |
| C5 | Acquire substantial bodies of new knowledge |

How will you learn?

The majority of taught modules consist of three hour lecture blocks, with some modules incorporating substantial computer laboratory sessions. The project is undertaken within the "Particle Physics Research Centre" group at QMUL and uses computational, theoretical or laboratory methods as appropriate and may well involve additional, technical training. In all cases the project involves weekly one to one meetings with the supervisor.

How will you be assessed?

The majority of taught modules are assessed by a final examination (typically 90% of the final mark) and by coursework (typically 10% of the final mark), although individual module mark schemes may vary from this. The compulsory MSc Physics project is assessed by the final written report (90% of the final mark) and student performance during the project (10% of the final mark).

How is the programme structured?

Please specify the structure of the programme diets for all variants of the programme (e.g. full-time, part-time - if applicable). The description should be sufficiently detailed to fully define the structure of the diet.

The programme consists of 120 credits of taught modules (chosen from the list of approved modules) taken during semesters 1 and 2 (and examined during the May/June examination period) and a compulsory 60 credit MSc Physics Research Project (SPA7012P) undertaken during semesters 2 and 3. The MSc project will be based on a Particle Physics topic. In addition to the Particle Physics project, there are compulsory taught modules:

Semester A

SPA7018P Relativistic Waves & Quantum Fields

Semester B

SPA7001P Advanced Quantum Field Theory

SPA7029P Collider Physics

Students can pick from any of the level 7, 15 credit elective modules to the total of 120 credits:

INK7022P Mathematical Methods for Theoretical Physics

INK7020P Lie Groups and Lie Algebras

INR7007P Statistical Mechanics

SPA7013P Phase Transitions

INU7001P Advanced Quantum Theory

INU7067P Advanced Topics in Statistical Mechanics

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SPA7024P Functional Methods in Quantum Field Theory
SPA7031P Differential Geometry in Theoretical Physics
INU7071P Galaxy Dynamics, Formation and Evolution
INU7056P Advanced Physical Cosmology
INU7003P Atom and Photon Physics
INK7048P Advanced Photonics
INU7022P Quantum Computation and Communication
INR7015P Quantum Electronics of Nanostructures
INU7014P Molecular Physics
INU7017P Particle Physics
INR7003P Particle Accelerator Physics
INK7066P Modelling Quantum Many-Body Systems
INU7016P Order and Excitations in Condensed Matter
INK7037P Theoretical Treatments of Nano-systems
INR7012P Physics at the Nanoscale
SPA7008P Electronic Structure Methods
INR7008P Superfluids, Condensates and Superconductors
INK7067P Advanced Condensed Matter
INK7032P Standard Model Physics and Beyond
INR7002P Nuclear Magnetic Resonance
INR7014P Statistical Data Analysis
INK7034P String Theory and Branes
INK7054P Supersymmetry
SPA7023P Stellar Structure and Evolution
SPA7005P Cosmology
SPA7019P Relativity and Gravitation
SPA7006P Electromagnetic Radiation in Astrophysics
INU7045P Planetary Atmospheres
INU7008P Solar Physics
SPA7022P Solar System
SPA7010P The Galaxy
SPA7004P Astrophysical Plasmas
INU7026P Space Plasma and Magnetospheric Physics
SPA7009P Extrasolar Planets & Astrophysical Discs
INK7051P Environmental Remote Sensing
INU7013P Molecular Biophysics
INK7068P Cellular Biophysics
INK7001P Theory of Complex Networks
INK7002P Equilibrium Analysis of Complex Systems
INK7004P Dynamical Analysis of Complex Systems
INK7005P Mathematical Biology
INK7003P Elements of Statistical Learning
SPA7028P Advanced Cosmology
SPA7029P Collider Physics
SPA7031P Supersymmetric Methods in Theoretical Physics
INR7018P Computer Simulation in Condensed Matter
INK7069P Dark Matter and Dark Energy
SPA7032P Introduction to Strings and Branes (N.B. From September 2018)
INU7089P Physical Models of Life
Plus any new level 7 modules belonging to SPA and the intercollegiate programme.

Academic Year of Study

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| Module Title | Module Code | Credits | Level | Module Selection Status | Academic Year of Study | Semester |
|--------------|-------------|---------|-------|-------------------------|------------------------|----------|
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What are the entry requirements?

The entrance requirements would require students to have at least an upper second class degree in Physics or closely related discipline; in exceptional circumstances students may be admitted with a lower second class degree. Students would have to achieve at least 6.5 IELTS score and the equivalent in the relevant TOEFL assessment. This is in line with the current Science and Engineering requirements.

How will the quality of the programme be managed and enhanced?

How do we listen to and act on your feedback?

The Staff-Student Liaison Committee provides a formal means of communication and discussion between Schools and its students. The committee consists of student representatives from each year in the school/institute together with appropriate representation from staff within the school/institute. It is designed to respond to the needs of students, as well as act as a forum for discussing programme and module developments. Staff-Student Liaison Committees meet regularly throughout the year. Each school operates a Learning and Teaching Committee, or equivalent, which advises the School/Institute Director of Taught Programmes on all matters relating to the delivery of taught programmes at school level including monitoring the application of relevant QM policies and reviewing all proposals for module and programme approval and amendment before submission to Taught Programmes Board. Student views are incorporated in this Committee's work in a number of ways, such as through student membership, or consideration of student surveys.

All schools operate an Annual Programme Review of their taught undergraduate and postgraduate provision. The process is normally organised at a School-level basis with the Head of School, or equivalent, responsible for the completion of the school's Annual Programme Reviews. Schools/institutes are required to produce a separate Annual Programme Review for undergraduate programmes and for postgraduate taught programmes using the relevant Undergraduate or Postgraduate Annual Programme Review pro-forma. Students' views are considered in this process through analysis of the NSS and module evaluations.

What academic support is available?

The students will be allocated an academic advisor as well as a project supervisor. Weekly project supervision meetings are expected.

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Programme-specific rules and facts

Specific support for disabled students

Queen Mary has a central Disability and Dyslexia Service (DDS) that offers support for all students with disabilities, specific learning difficulties and mental health issues. The DDS supports all Queen Mary students: full-time, part-time, undergraduate, postgraduate, UK and international at all campuses and all sites.

Students can access advice, guidance and support in the following areas:

- Finding out if you have a specific learning difficulty like dyslexia
- Applying for funding through the Disabled Students' Allowance (DSA)
- Arranging DSA assessments of need
- Special arrangements in examinations
- Accessing loaned equipment (e.g. digital recorders)
- Specialist one-to-one "study skills" tuition
- Ensuring access to course materials in alternative formats (e.g. Braille)
- Providing educational support workers (e.g. note-takers, readers, library assistants)
- Mentoring support for students with mental health issues and conditions on the autistic spectrum.

Links with employers, placement opportunities and transferable skills

The School has a dedicated SEPnet Employer Engagement Officer who provides links between students and industry, arranging work placement opportunities.

Programme Specification Approval

Person completing Programme Specification:

Rodolfo Russo

Person responsible for management of programme:

Rodolfo Russo

Date Programme Specification produced / amended by School / Institute Learning and Teaching Committee:

2 October 2018

Date Programme Specification approved by Taught Programmes Board: