

PROGRAMME SPECIFICATION

This document describes the one-year MSc programmes offered in the Physics Department. These are **Master of Science in Physics Research**, and **Master of Science in Nanotechnology and Low Temperature Physics**. This specification is valid for new entrants from **September 2005**.

The aims of these programmes are to equip students for future careers in research in universities, industry and other organisations as well as to provide a technical background for a broader range of careers in the industrial scientific instrument sector and elsewhere. The scope of the programmes caters for a spectrum of students, from those whose predominant interest is in fundamental science, to those whose interests are more applied.

The aims of the programmes are in accord with the College Mission Statement, with its emphasis on ensuring 'the highest quality of teaching and learning, led by active research and scholarship'.

Physics Research

In this programme we aim to provide a stimulating and supportive learning environment in which students will:

- be given training in research techniques;
- receive selected training in a specialized branch of Physics;
- obtain facilities for an individual research project supervised by a member of the academic staff;
- develop key skills relevant for a postgraduate science student

The major objective of the programme is to provide a grounding in Physics research techniques which can either be seen as a complete course of study in itself or as a basis for future research leading to a more advanced qualification.

Nanotechnology and Low Temperature Physics

In this programme we aim to provide a stimulating and supportive learning environment in which students will:

- develop an advanced knowledge of nanophysics and low temperature physics via lecture courses;
- obtain training in research techniques in the field through lecture courses and an individual project;
- develop key skills relevant for a postgraduate science student.

The Department has close links with Oxford Instruments plc (a major employer in the field), the National Physical Laboratory and other institutions. An important element of this programme, which ensures its wider relevance, involves such industrial involvement in the programme. This entails:

- input on the course content;
- suggestions of topics for project work;
- visits to industrial facilities and laboratories;
- guest lectures.

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Learning outcomes

The programme complies fully with Descriptors for a Masters level qualification set out by the Quality Assurance Agency for Higher Education in England and Wales (QAA) as all of its learning outcomes are at Masters (M) level. In general terms the programme provides opportunities for students to develop and demonstrate the following learning outcomes:

Knowledge and understanding - Physics Research

As a result of carrying out the research project students should develop research skills using a mix of experimental, theoretical and computational techniques appropriate to the field together with related transferable skills. Students should develop their communication skills and apply them to the writing of the project report and the presentation of an oral report on the project at the viva.

As a result of attending the courses students should increase their knowledge and understanding of the specialised field of their project.

Knowledge and understanding - Nanotechnology and Low Temperature Physics

On successfully completing the programme a student should have a very good understanding of a broad range of physics at low temperatures, nanophysics and associated techniques, assessed by performance in module examinations, coursework and laboratory work. Through this laboratory work and the project the student will receive a broad training in experimental methods at a level appropriate for a postgraduate masters qualification. Students will develop their theoretical understanding of the subject. Depending on the choice of project they will acquire skills in computerised data acquisition, data analysis, and computational and theoretical physics. Through contacts with participating industrial organisations, the student should gain some awareness of the wider significance and applicability of the concepts, methods and techniques which form part of the course.

Skills and other attributes

The students should develop a range of generic key skills as required by a scientific researcher, including:

- problem-solving skills;*
- investigative skills;*
- information retrieval skills;*
- communication skills;*
- analytical skills;*
- IT skills;*
- personal skills.*

* transferable skills

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Teaching, learning and assessment

A variety of teaching methods will be used, including lectures, seminars and one-on-one sessions. Assessment is based on the Project dissertation, module examinations and coursework. Full details of the assessments for individual courses can be obtained from the [Department](#).

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Details of the programme structure(s)

Each programme comprises 90 ECTS.

Physics Research

- Research Project PH5040 – 67.5 ECTS. This makes up 3/4 of the assessment;
- Three further PH5xxx modules chosen from the list below

Nanotechnology and Low Temperature Physics

- Project PH5060 – 30 ECTS. This makes up 1/3 of the assessment.
- PH5110 Research Review – 7.5 ECTS

- PH5475 Physics at the Nanoscale – 7.5 ECTS
- PH5478 Superfluids, Condensates and Superconductors – 7.5 ECTS
- Five further PH5xxx modules chosen from the list below; strongly recommended are PH5473 Theoretical Treatments of Nano-systems and PH5512 Nuclear Magnetic Resonance.

Code	Course Title	ECTS
PH5110	Research Review	7.5
PH5211	Statistical Mechanics	7.5
PH5226	Advanced Quantum Theory	7.5
PH5242	Relativistic Waves & Quantum Fields	7.5
PH5245	Advanced Quantum Field Theory	7.5
PH5261	Electromagnetic Theory	7.5
PH5317	Galaxy and Cluster Dynamics	7.5
PH5421	Atom and Photon Physics	7.5
PH5427	Quantum Computation and Communication	7.5
PH5431	Molecular Physics	7.5
PH5442	Particle Physics	7.5
PH5450	Particle Accelerator Physics	7.5
PH5472	Order and Excitations in Condensed Matter	7.5
PH5473	Theoretical Treatments of Nano-systems	7.5
PH5475	Physics at the Nanoscale	7.5
PH5478	Superfluids, Condensates and	7.5
PH5501	Superconductors	7.5
	Standard Model Physics and Beyond	
PH5512	Nuclear Magnetic Resonance	7.5
PH5515	Computing and Statistical Data Analysis	7.5
PH5534	String Theory and Branes	7.5
PH5541	Supersymmetry and Gauge Symmetry	7.5
PH5600	Stellar Structure and Evolution	7.5
PH5601	Advanced Cosmology	7.5
PH5602	Relativity and Gravitation	7.5
PH5603	Astrophysical Fluid Dynamics	7.5
PH5630	Planetary Atmospheres	7.5
PH5640	Solar Physics	7.5
PH5650	Solar System	7.5
PH5660	The Galaxy	7.5
PH5680	Space Plasma and Magnetospheric Physics	7.5
PH5690	Extrasolar Planets and Astrophysical Discs	7.5
PH5670	Astrophysical Plasmas	7.5
PH5800	Molecular Biophysics	7.5
PH5810	Theory of Complex Networks	7.5
PH5820	Equilibrium Analysis of Complex Systems	7.5
PH5830	Dynamical Analysis of Complex Systems	7.5
PH5840	Mathematical Biology	7.5
PH5850	Elements of Statistical Learning	7.5

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Progression and award requirements

To obtain an MSc award, students must obtain an overall average mark of at least 50% and a mark of at least 50% for the Project. Provided these marks are achieved a Pass may be awarded as long as no component has a mark of less than 40%.

Otherwise, failure of a written examination requires a re-sit to be completed successfully in the following year in order to obtain the MSc. Failure in the Project requires a resubmission in the subsequent year.

The Masters degree with Merit may be awarded if a student achieves an overall weighted average of 65.00% or above, with no mark in any element which counts towards the final assessment falling below 50%.

The Masters degree with Distinction may be awarded if a student achieves an overall weighted average of 70.00% or above, with no mark in any element which counts towards the final assessment falling below 60%. A Distinction will not normally be awarded if a student re-sits or re-takes any element of the programme. In exceptional circumstances a viva may be held for a student at the request of the Examiners.

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Student support and guidance

The Director of Graduate Studies holds an induction meeting for all new postgraduate students in the first week of the programme. The Programme Director is also normally present at this meeting. Formal aspects of being a member of the College and the Physics Department are discussed, and guidance on safety matters is given. Introductions are made to other members of the Department, the Library, computing facilities and other central services.

The Programme Director provides primary support for each student, including overall personal and academic welfare. The project supervisor provides additional academic support. Teachers of the lecture courses monitor progress on the courses. Supervisors and teachers provide progress reports on each student at each meeting of the Postgraduate Committee.

As this is a postgraduate course, the social integration of students is achieved by incorporating them into the activities of the appropriate research group and other postgraduate activities and structures already in place in the Department. These include postgraduate seminars and meetings, research colloquia, Physics Society meetings and parties.

All other College support services are available to students on the programmes. These are described in the *College Student Handbook* and the *Student Union Handbook*. Part 1 of the Department's *Handbook for Physics Students* also contains useful information about facilities available in the Department.

Students worried about any aspects of the course or the support they are receiving may consult the Programme Director or the Director of Graduate Studies at any time. At College level they may contact the Dean of the Graduate School.

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Admission requirements

Admission to the programmes depends on the applicant's qualifications and experience, which must satisfy the conditions of entry to the MSc degree established by the University of London. Graduates of British universities are normally required to have a First or Second Class Honours degree in Physics. Alternatively, students may have such a degree in a related subject such as electronics or engineering; such students will be expected to have taken courses in those topics relevant to their project and programme of study. Applications from candidates who hold other qualifications or who have relevant work experience will also be considered. Students whose first language is not English may also be asked for a qualification in English Language at an appropriate level. For further details please refer to the [Prospective Students](#) web page. It may also be helpful to contact the [Admissions Office](#) for specific guidance on the entrance requirements for particular programmes.

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Further learning and career opportunities

These programmes provide an ideal grounding for students to pursue PhD programmes in universities, and to equip them for future careers in research in universities, industry and other organisations. The programmes will also provide a technical background for a broader range of careers in the industrial scientific instrument sector and elsewhere. For more details on further learning and career opportunities please refer to the [Careers Service](#).

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Indicators of quality and standards

Royal Holloway's position as one of the UK's leading research-intensive institutions was confirmed by the results of the most recent Research Assessment Exercise (RAE 2008) conducted by the Higher Education Funding Council (HEFCE). The new scoring system for the RAE 2008 measures research quality in four categories, with the top score of 4* indicating quality that is world-leading and of the highest standards in terms of originality, significance and rigour. 60% of the College's research profile is rated as world-leading or internationally excellent outperforming the national average of 50%. The College is ranked 16th in the UK for research of 4* standard and 18th for 3* and 4* research. 55% of the Physics Department's research profile is of 3* and 4* standard.

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List of programmes

The programmes are taught by staff at Royal Holloway, in conjunction with staff from other colleges of the University for some of the taught courses. They lead an award of the University of London. Programmes in Physics are not subject to accreditation by a professional body. The Banner programme codes are given in parentheses.

Master of Science Programmes in Physics

MSc Physics Research (1345)

MSc Nanotechnology and Low Temperature Physics (1332)

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