MPhys THEORETICAL PHYSICS *UCAS Code: F323*

Degree programme for students entering Part 1 in October 2006

Awarding Institution:	The University of Reading
Teaching Institution:	The University of Reading
Relevant QAA subject benchmarking group:	Physics and Astronomy
Faculty of Science	Programme length: 4 years
Date of specification:	3 June 2006
	Revised 6 February 2008
Programme Director	Dr R.J.Stewart
Programme Advisers	Dr R.J.Stewart
Board of Studies:	MMP

Accreditation: This degree programme is accredited by the *Institute of Physics*

Aims

To provide graduates with a secure and demonstrable knowledge and skills base in theoretical physics and mathematical modelling, with sufficient scope, depth and experience of research through project work to fit them for a career in theoretical physics or for further postgraduate physics studies.

Transferable skills

The University's Strategy for Teaching and Learning has identified a number of generic transferable skills that all students are expected to have developed by the end of their degree programme. In following this programme, students will have had the opportunity to enhance their skills relating to career management, communication (both written and oral), information handling, numeracy, problem-solving, team working and use of information technology.

By the end of the programme students are expected to have gained experience and show competence in the following transferable skills: IT (word-processing, using standard and mathematics software), scientific writing, oral presentation, team-working, problem-solving, use of library resources, time-management, career and management and planning.

Programme content

The profile that follows states which modules must be taken (the compulsory part), together with one or more lists of modules from which the student must make a selection (the "selected" modules). Students must choose such additional modules as they wish, in consultation with their programme adviser, to make 120 credits in each Part. The number of modules credit for and the level of each module are shown in brackets after its title.

PART 1 (2006-2007)

Compulsory Modules

Module Code	*Module Name*	*Credits*	*Level*
MA11A	Analysis	20	C
MA11B	Calculus and Mathematical Modelling	20	C
MA11C	Matrices, Vectors and Applications	20	C

PH1006	Great Ideas in Physics	20	C
PH1002	Classical Physics	20	C
PH1004	Experimental Physics I	20	C

PART 2 (2007-2008)
Compulsory Modules

Module Code	*Module Name*	*Credits*	*Level*
MA241	Numerical Analysis	10	I
MA24B	Differential Equations	20	I
PH2001	Thermal Physics	20	I
PH2002	Quantum Physics	20	I
PH2003	Electromagnetism	20	I
PH2005	Introductory Computational Physics	20	I
PH2501	Applied Physics	10	I

Note: PH2001 contains 5 credits of Introduction to Condensed Matter Physics and 5 credits of Career Skills

PART 3 (2008–2009)
Compulsory Modules

Module Code	Module Name	Credits	Level
MA37E	Numerical Analysis and Dynamical Systems 1	20	H
PH3701	Relativity	10	H
PH3702	Condensed Matter	10	H
PH3703	Atomic & Molecular Physics	10	H
PH3715	Statistical Mechanics	10	H
PH3716	Physics in Archaeology	10	H
PH3801	Nuclear & Particle Physics	10	H
PH3809	Problem-Solving in Physics	10	M

Selected Modules
Modules to a total of 10 credits selected from:

MA3D7	History of Mathematics and its Applications	10	H
PH3708	Medical Physics	10	M
PH3713	Laser Physics	10	M

Mathematics and Meteorology modules may be selected subject to time-tabling constraints and with the approval of the Programme Director.

Modules to a total of 20 credits selected from:

PH3806	Atomic & Molecular Physics II	10	H
PH3807	Cosmology I	10	H
PH3811	Stellar physics	10	H

Mathematics and Meteorology modules may be selected subject to time-tabling constraints and with the approval of the Programme Director.

PART 4 (2009-2010)
Compulsory Modules

Module	*Module Name*	*Credits*	*Level*
PH4001	Research Project	60	M
PH4A03	Current Topics	10	M
PH4A01	Advanced Quantum Theory	10	M

PH4A02	Lagrangian Field Theory & Symmetry	10	M

Selected Modules
Modules to a total of 30 credits selected from:
(Note – a module taken in Part 3 cannot be repeated)

PH3708	Medical Physics	10	M
PH3713	Laser Physics	10	M
PH4B16	Atomic & Molecular Physics M	10	M
PH4B17	Cosmology M	10	M
PH4B04	Particle Physics and the Standard Model	10	M
PH4B01	Statistical Physics & Critical Phenomena	10	M
PH4B02	Modern Spectroscopic Techniques	10	M

Progression
To gain a threshold performance at Part 1 a student shall normally be required to achieve an overall average of 40% over 120 credits taken in Part 1, and a mark of at least 30% in individual modules amounting to not less than 100 credits. In order to progress from Part 1 to Part 2, a student shall normally be required to achieve a threshold performance at Part 1 and achieve a minimum of 30% in each of PH1006, PH1002, MA11B, and PH1004.

To gain a threshold performance at Part 2 a student shall normally be required to achieve an overall average of 40% over 120 credits taken in Part 2, and a mark of at least 30% in individual modules amounting to not less than 100 credits. In order to progress from Part 2 to Part 3 on the MPhys programme, a student shall normally be required to achieve a threshold performance at Part 2 and achieve an overall average of **50%** over 120 credits taken in Part 2 (of which not less than 100 credits should normally be at I level or above) and achieve a mark of not less than 30% in modules PH2001, PH2002 and PH2003. Students who do not achieve the requirements of the MPhys programme, but have achieved the threshold performance with not less than 30% in modules PH2001, PH2002 and PH2003 will not normally be permitted to continue on the MPhys programme, but will be offered the option of transferring to a BSc programme.

Summary of teaching and assessment
A wide variety of teaching/learning methods are used; lectures; problem-solving workshops; independent-learning; FLAP; practical laboratories; computational laboratories; projects.
The teaching is organised in modules: In a typical lecture-based module the teaching is supplemented by problem-solving workshops that provide interaction between student and lecturer.
Modules are assessed by a combination of continuous assessment and formal examinations. The aim of the continuous assessment is to provide feedback to each student as the module progresses.
The final-year project (under the guidance of a project supervisor) provides an opportunity for independent learning and investigation.

The contributions of Parts 2, 3 and 4 to the final degree assessment for Physics-administered MPhys programmes will be in the proportions 1:2:2. For BSc

programmes, the contributions of Part 2 and Part 3 to the final assessment will be in the proportions of 1:2.

Admission requirements
Entrants to this programme are normally required to have at least:
UCAS Tariff 280 pts, including 180 pts in physics and mathematics.
There is no points distinction between BSc and MPhys entry but MPhys has more stringent progression rules at the end of the second year.

Admissions Tutor: Dr M Hilton.

Support for students and their learning
University support for students and their learning falls into two categories. Learning support includes IT Services, which has several hundred computers and the University Library, which across its three sites holds over a million volumes, subscribes to around 4,000 current periodicals, has a range of electronic sources of information and houses the Student Access to Independent Learning (S@IL) computer-based teaching and learning facilities. There are language laboratory facilities both for those students studying on a language degree and for those taking modules offered by the Institution-wide Language Programme. Student guidance and welfare support is provided by Personal Tutors, the Careers Advisory Service, the University's Special Needs Advisor, Study Advisors, Hall Wardens and the Students' Union.

Within the contributing departments additional support is given though practical classes in Part 1. The development of problem-solving skills is assisted by extensive provision of model solutions to problems. There is a Course Adviser to offer advice on the choice of modules within the programme.

Career prospects
In recent years the graduates on Reading physics-based degrees have progressed to careers in

- Scientific Research in Government and Industrial Laboratories
- Computing and IT industry
- Electronic engineering
- Production engineering
- Management in industry
- Accountancy and Financial Sector

and also to Further education (PhD, MSc and BEd degrees).

Opportunities for study abroad
Opportunities for study abroad within the EU are available through the University Study Abroad Programme.

Educational aims of the programme
To provide graduates with a secure and demonstrable knowledge and skills base in theoretical physics and mathematical modelling, with sufficient scope, depth and experience of research through project work to fit them for a career in theoretical physics or for further postgraduate physics studies.

Programme Outcomes

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas:

Knowledge and Understanding

A. Knowledge and understanding of: The empirical nature of physics: that theories must be testable and must be tested quantitatively. The core topics of physics: classical and quantum mechanics; thermal and statistical physics; wave, optics and electromagnetism; particle physics. The application of physical and mathematical methods to the description, modelling and prediction of physical phenomena. Some of the frontiers of current research	Teaching/learning methods and strategies The knowledge required for the basic topics is delineated in formal lectures supported by problem-solving workshops. The knowledge required for more specialist topics is enhanced through self-learning based on guided reading, problem solving and project work. Investigation of some of current research topics in undertaken as a series of team projects in each of the first three years Assessment Most knowledge is tested through a combination of coursework and unseen formal examinations. Practical work is assessed by means of logbooks, reports and viva examinations. Dissertation and oral presentations also contribute.

Skills and other attributes

B. Intellectual skills – the ability to: Recognise and use subject-specific theories, paradigms, concepts and principles Analyse, synthesise and summarise information critically Apply knowledge and understanding to address familiar and unfamiliar problems Collect and integrate evidence to formulate and test hypotheses	Teaching/learning methods and strategies Most modules are designed to develop 1 and 2. 1, 2 and 3 are enhanced through the use of coursework assignments, and project work. 4 is enhanced mainly by project work. Assessment 1-3 are assessed indirectly in most parts of the programme. 3 is also assessed by a general problem-solving paper in finals. 4 is assessed in the final-year research project.

C. Practical skills

1. Planning, conducting, and reporting on experimental investigations
2. Planning, conducting, and reporting on theoretical/computational investigations
3. Referencing work in an appropriate manner

Teaching/learning methods and strategies

Laboratory work, projects and IT classes are designed to enhance skills 1 and 2.
3 is emphasised through guidelines and advice given to students in connection with project work.

Assessment

1 and 2 are tested in laboratory classes and projects.
3 is assessed in experimental and project reports

D. Transferable skills

1. Communication: the ability to communicate knowledge effectively through written and oral presentations.
2. Numeracy and C & IT: appreciating issues relating to treatment of laboratory data; preparing, processing, interpreting and presenting data; solving numerical problems using computer and non-computer based techniques; using the Internet critically as a source of information.
3. Interpersonal skills: ability to work with others as a team, share knowledge effectively; recognise and respect the views and opinions of other team members.
4. Self management and professional development: study skills, independent learning, time management, identifying and working towards targets for personal, academic and career development
5. Library skills: the effective use of library and internet resources.

Teaching/learning methods and strategies

Skill listed under 1 and 2 are developed throughout most of the programme, but especially through practical and project work.
3 is encouraged through team-working within several modules.
4 is enhanced partly through the provision of a Career Development Skills module during part 3, and partly through a PAR tutorial system.
5 is covered by study skills incorporated in Part I modules.

Assessment

1 is assessed directly as an outcome of project work, and contributes to the assessment of practical work. 2 is assessed directly in the Computational Physics module and indirectly in most laboratory modules. Skills in 3, 4 and 5 are not assessed but their effective use will enhance performance in H level modules.

Please note - This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in the module description and in the programme handbook. The University reserves the right to modify this specification in unforeseen circumstances, or where the process of academic development and feedback from students, quality assurance processes or external sources, such as professional bodies, requires a change to be made. In such circumstances, a revised specification will be issued.