BSc PHYSICS WITH FOUNDATION YEAR UCAS Code F304

Degree programme for students entering Foundation Year in October 2003

Awarding Institution:	The University of Reading
Teaching Institution:	The University of Reading
Relevant QAA subject benchmarking group:	Physics
Faculty of Science	Programme length: 4 years

Date of specification: 20 March 2004

Programme Director:	Dr D. Dunn
Programme Adviser:	Dr P A Hatherly
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 physics, an appreciation of the context and impact of physics and the ability to apply the power of scientific methodology.

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.

The Foundation Year and the Physics degree programmes

The *Foundation Year for Physics* is a one-year full-time equivalent programme that forms the first part of a route leading into any of the 3-year BSc physics degree programmes available at the University of Reading, It thus forms part of a four year progamme leading to a range of BSc degrees rather than being a free-standing one-year course. For convenience a single course code, F304, is used to specify this single entry route into a range of possible physics-based BSc degree courses. The same Foundation Year programme is also used by the Department of Meteorology as a route leading into the 3-year BSc Meteorology degree programme. When used in this way the programme is described as *The Foundation Year for Meteorology* and the entry course code is F958.

The Foundation Year may also be taken as an ad hoc course by a range of other students who are not following BSc programmes at the University of Reading and in this use it is regarded as a free-standing one-year programme.

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.

In the Foundation Year the syllabus is defined by two modules – Foundation Physics (PH0001) and Foundation Mathematics for Physics (PH0002). Taken together these two modules cover core physics and mathematics material and some optional physics topics. The material for physics and mathematics is selected from the *Flexible Learning Approach to Physics* (*FLAP*) resource and takes the form of a set of core *FLAP* modules in physics and mathematics together with some optional extension *FLAP* modules in physics. The core material is sufficient to support entry into Part I of a physics-based degree course and nominally covers the material within the A-level mathematics and A-level physics syllabuses. There are important differences in the way that this material is treated in the Foundation Year, with the depth and rigour of the coverage being greater than at A-level. The Foundation Year is designed to support a physics-based degree course in a way that would not be possible at A-level, where physics and mathematics are taught as independent subjects. In the Foundation Year the physics and mathematics are woven into an integrated programme, with the mathematics introduced thoroughly but in the context of physics and then used extensively within physics. Also, the mathematics in *FLAP* is made to conform with its use in physical science – for example, by using dimensions and requiring dimensional integrity. There are also some mathematical topics needed in physics, such as vectors and calculus, that are covered with greater rigour and depth than at A-level. Many physics topics are also treated more thoroughly than at A-level, as befits a programme designed specifically to support degrees in physical science. The laboratory work for the course emphasises the development of general laboratory skills. These include basic competencies in handling a wide range of apparatus, presentation and handling of data and error analysis. This approach is designed to feed effectively into Part 1 laboratory work

FOUNDATION YEAR *(2003-2004)*

Compulsory Modules

Module Code	*Module Name*	*Credits*	*Level*
PH0001	Foundation Physics	60	C
PH0002	Foundation Mathematics for Physics	60	C

PART 1 *(2004-2005)*

Compulsory Modules

Module Code	*Module Name*	*Credits*	*Level*
PH1001	Concepts in Physics	20	C
PH1002	Classical Physics	20	C
MA111	Mathematics for Scientists	20	C
PH1004	Experimental Physics I	20	C
PH1101	Current Research Topics I	10	C
PH1201	Problem-solving	10	C

Selected Modules

Modules to a total of 20 credits selected from:

Physics			
PH1005	Exploring the Universe	20	C
Computer Science			
CS1A2	Programming 1	10	C
CS1B2	Programming 2	10	C
CS1C2	Introductory Programming 1	10	C
CS1D2	Introductory Programming 2	10	C
Chemistry			
CH1A2	Intro. to Inorganic & Physical Chemistry	20	C
Language			
	Part I IWLS Language module	20	

Time-tabling constraints may mean that not all of these options are available.

PART 2 *(2005-2006)*

Compulsory Modules

Module	Module Name	Credits	Level
PH2001	Thermal Physics	20	I
PH2002	Quantum Physics	20	I
PH2003	Electromagnetism	20	I
PH2004	Advanced Experimental Physics	20	I
PH2502	Applications of Physics	10	I
PH2401	Programming Skills	10	I

Note: PH2001 contains 5 credits of Career Skills

Selected Modules

Select ONE of

Module Code	Module Name	Credits	Level
PH2007	Group Projects in Physics	20	I
	IWLS language module	20	I

PART 3 *(2006-2007)*

Compulsory Modules

Module	*Module Name*	*Credits*	*Level*
PH3701	Relativity	10	H
PH3702	Condensed Matter	10	H
PH3703	Atomic & Molecular Physics	10	H
PH3801	Nuclear & Particle Physics	10	H
PH3003	Physics Project	40	H
PH3809	Problem-Solving in Physics	10	H
PH3709	Statistical Mechanics	10	H

Selected Modules

Choose ONE from

Module	*Module Name*	*Credits*	*Level*
PH3706	Physics of Music	10	H
PH3707	Computational Physics I	10	H
PH3708	Medical Physics	10	M
PH3713	Laser Physics	10	M

Mathematics and Meteorology modules may be selected with the approval of the Programme Director.

Choose ONE from

PH3811	Stellar physics	10	H
PH3806	Atomic & Molecular Physics II	10	H
PH3807	Cosmology I	10	H
PH3808	Computational Physics II (requires PH3707)	10	H
PH3804	Fractals & Chaos	10	M

Mathematics and Meteorology modules may be selected with the approval of the Programme Director.

Progression

Progression from Foundation to Part I requires an average of at least 55% over the six modules.
To proceed to Part 2 of this degree it is sufficient to obtain an average of at least 40% with no module mark below 30%.
Marks of less than 30% in modules to a total of 20 credits, except for modules PH1001, PH1002, MA111, and PH1004, may be condoned provided that the candidate has pursued the course for the module with reasonable diligence and has not been absent from the examination without reasonable cause.

To proceed to Part 3 of this degree it is sufficient to obtain an average of at least 40%, with no module mark below 30%.
Marks of less than 30% in modules to a total of 20 credits, except modules PH2001, PH2002, PH2003 and PH2004, may be condoned provided that the candidate has pursued the course for the module with reasonable diligence and has not been absent from the examination without reasonable cause.

Summary of teaching and assessment

Foundation Year
A wide variety of learning and teaching methods are used, including independent-learning (*FLAP* based), tutorials, problem-solving workshops; and practical laboratories.

Laboratory work is skills-based and concentrates on developing the hands-on practical skills needed for experimental work, along with data-handling skills.

PARTS 1-3

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 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 obtained:
Grade C or better in English in GCSE; and achieved
UCAS Tariff: 200 points
Two AS grades are accepted in place of one A-Level. Applications from mature students are handled individually, giving due regard to work experience and motivation.

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.

At departmental level the Learning Resource Centre provides access to recommended texts, course notes, audio, video and computer software support and gives internet access.

Educational aims of the programme

The *Summary of programme aims*, given earlier, specifies these as being to establish a thorough knowledge and skills base in mathematics and physics for entry into a physics or meteorology degree course from a wide range of student backgrounds and to encourage the development of independent learning skills through supported self-study

Career prospects

Physics graduates can expect a very wide range of career opportunities arising from their subject-based skills of problem-solving, mathematics, information technology and scientific methodology, and their extensive base in transferable skills. The Foundation Year, as part of the physics degree training, begins to develop these skills and widens participation in these benefits.

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

There are no formal arrangements for this degree programme but a transfer to the degree *Physics with a Year in Europe* may be possible.

Educational aims of the programme

To provide graduates with a secure and demonstrable knowledge and skills base in physics, an appreciation of the context and impact of physics and the ability to apply the power of scientific methodology.

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:

1. The empirical nature of physics: that theories must be testable and must be tested quantitatively.
2. The core topics of physics: classical and quantum mechanics; thermal and statistical physics; wave, optics and electromagnetism; particle physics.
3. The application of physical and mathematical methods to the description, modelling and prediction of physical phenomena.

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.

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.

In Foundation Year there are regular tests.

Skills and other attributes

B. Intellectual skills – the ability to:

1. Recognise and use subject-specific theories, paradigms, concepts and principles
2. Analyse, synthesise and summarise information critically
3. Apply knowledge and understanding to address familiar and unfamiliar problems
4. 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 project.

In Foundation Year the weekly unseen tests include some questions that probe cognitive skills and skills of synthesis and analysis.

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 in laboratory and project modules.

3 is assessed as part of experimental and project reports

In Foundation Year: Marked laboratory reports and skill achievement sheets. Viva examinations.

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.

In Foundation Year regular scheduled tests probe understanding and study discipline.

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 expect 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 module and programme handbooks.