



UCL

BSc/MSci Programme Structures
(Full-time Undergraduate Degrees)

SESSION 2006/2007

Dates of College Terms 2006/2007

The College terms for session 2006/2007 are:

First Term: Monday, 25 September 2006- Friday, 15 December 2006	(12 weeks)
Second Term: Monday, 08 January 2007 – Friday, 23 March 2007	(11 weeks)
Third Term: Monday, 23 April 2007 - Friday, 08 June 2007	(7 weeks)

While every effort has been made to ensure the accuracy of the information in this document, the Department cannot accept responsibility for any errors or omissions contained herein.

A copy of this Handbook may be found at the Departmental Web site: www.phys.ucl.ac.uk.

FOREWORD

This handbook contains information on all the full-time degree programmes and their constituent courses, which the Department of Physics and Astronomy plans to offer in Session 2006/2007. Please note that it cannot be guaranteed that all courses offered will run and that only the most usual pre-requisites for courses are given.

The handbook is divided into three sections:

SECTION 1 – provides a brief overview on the different degree programmes.

SECTION 2 – provides details of the year-by-year course structure for each degree programme.

SECTION 3 – contains short descriptions of the individual courses.

An extended version of this handbook, which contains, in addition to the above, Aims and Objectives for each degree programme, is with the Teaching Support Co-ordinator and is posted on the Departmental Web site: www.phys.ucl.ac.uk.

Detailed syllabuses and course descriptions are given in the Departmental handbooks *Course Descriptions*. Information on individual courses may be obtained from the Undergraduate Teaching Secretary in the Departmental Office, Room E15, Ground Floor, Department of Physics and Astronomy.

Timetables for all courses can be found on the following noticeboards:

Outside the Tutors' Offices, Room E4 (Astronomy Programme Tutor) and Room E2 (Physics Programme Tutor).

Outside the Massey Theatre

If you need guidance on your choice of course(s), please contact either the Astronomy Programme Tutor, Dr. I. Furniss or the Physics Programme Tutor, Dr I.J. Ford.

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SECTION 1

1. FULL-TIME UNDERGRADUATE DEGREE PROGRAMMES

1.1 Overview

The Department offers a wide range of full-time undergraduate programmes for both the three-year BSc and four-year MSci honours degrees. These are listed in Table 1, along with the UCAS codes.

The present BSc and MSci degree structure was introduced in the 1993/94 session, following recommendations produced in 1990 by an Institute of Physics (IoP) report, "The Future Pattern of Higher Education in Physics".

The four-year MSci degree provides a longer educational experience and more specialist training for students who intend to proceed directly to academic or industrial research in the relevant field. It is the policy in this Department, and in most other major physics and astronomy departments in the UK, that the MSci route is recommended for direct transfer to a PhD programme. The three-year BSc programmes are designed for students who have a high interest in the relevant field, but do not necessarily wish to pursue it beyond a first degree. For others further study may involve a subsequent, one-year, taught MSc postgraduate programme. Both types of undergraduate degree provide substantial training in transferable skills to facilitate progression to a wide range of careers, both within and outside the physics and astronomy professions.

TABLE 1: Full-Time Undergraduate Degree programmes

Title of Programme	BSc UCAS Code	MSci UCAS Code
<u>Single Honours</u>		
Physics (p)	F300	F303
Theoretical Physics (p)	F340	F345
Physics with Space Science (p)	F3FN	F3FM
Physics with Medical Physics (p)	F351	
Medical Physics (p)		F350
Astronomy (a)	F500	F502
Astrophysics (a)	F510	F511
<u>Combined Honours</u>		
Astronomy and Physics	FF53	FFM3
Mathematics and Astronomy	GF15	GF1M
Mathematics and Physics	GF13	GF1H

Note: (p) = 'physics-related'; (a) = 'astronomy-related'

1.2 Aims and Objectives

The general teaching **aim** of the Department is to deliver a wide range of degree programmes, designed to develop a student's full potential, using the research strengths and experience of staff in a challenging, but friendly and supportive, environment. More specifically, our undergraduate programmes aim to:

- attract and recruit high quality applicants, whatever their background;
- encourage students to develop critical modes of thought and study, and an in-depth understanding of their chosen field of study;
- provide a sufficiently broad education, in specialist and transferable skills to facilitate progression to a wide variety of careers, both within and outside the physics and astronomy professions;
- equip students with knowledge and skills to progress to postgraduate study;

Associated with these aims are the **objectives** that a student should have achieved having successfully completed a given programme. Graduates for our full-time undergraduate programmes should have:

- followed a programme which is academically coherent, encompassing both depth and breadth;
- acquired a thorough knowledge and understanding of the scientific basis of their chosen field;
- gained practical and analytical skills through laboratory experiments and the ability to carry out accurate and informed analysis and interpretation of data;
- developed investigative skills (experimental and/or theoretical) through individual and/or team project work;
- learned how to communicate effectively, in speech and in writing, through the production of written essays, reports and oral presentations;
- developed basic skills in computer programming and information technology;
- in the case of MSci students, gained sufficient specialist knowledge in their 4th-year courses and research projects to allow a seamless progression to postgraduate study, including PhD programmes.

Detailed aims and objectives for each BSc and MSci degree, listed in Table 1, have been formulated and are reproduced in the Web version of this document (www.phys.ucl.ac.uk).

The detailed, year-by-year, course structures for each of the programmes listed in Table 1 are given in Section 2. Programmes are based on the University of London course-unit system. Most courses are of half-unit value and students normally take courses totaling four units per year. Following UCL guidelines, a half-unit course expects a total student commitment of 100-150 hours, including lectures, practicals, homeworks, private study and revision.

1.3 THE CORE FOR PHYSICS-RELATED DEGREES

Each of the physics-related degrees is built on a common core of half-unit courses, over the first three years of both the BSc and MSci programmes. The first two years of each BSc/MSci programme are generally taught in common and provide a transition from school and a firm foundation for future years. The core courses for the physics-related degrees are based on topics recommended by the IoP. These courses are indicated for each year in Table 2. Each module is identified by a four digit code (and prefixed by the Departmental code PHAS). These codes were new for 2005-6. The courses provide in the first year the firm foundation of subject strands in quantum-based phenomena and condensed matter, underpinned by mathematics 1245, 1246 and classical mechanics 1247, and a practical skills course 1240 which includes a substantial element of computer-based and IT skills training. These strands are developed in the second year through core courses in quantum physics 2222 and its application to atoms and molecules 2224, in condensed matter 2228 and in electromagnetic theory 2201, with the necessary mathematics further developed

2246. The quantum and condensed matter elements of the core are completed in the third year courses 3201, 3224, 3225, 3226. The framework prepares students for the 2nd and 3rd year course variations and options that differentiate the different degree programmes, and for the 4th year specialist courses.

TABLE 2: CORE COURSES FOR PHYSICS-RELATED DEGREES

YEAR 1	YEAR 2	YEAR 3
1102 Physics of the Universe	2246 Mathematical Methods III	3224 Nuclear and Particle Physics
1224 Waves, Optics and Acoustics	2222 Quantum Physics	3225 Solid State Physics
1228 Thermal Physics	2224 Atomic & Molecular Physics	3226 Quantum Physics
1240 Practical Skills 1C (Core Physics)	2228 Statistical Thermodynamics	3201 Electromagnetic theory
1245 Mathematical Methods I	2201 Electricity and Magnetism	
1246 Mathematical Methods II		
1247 Classical Mechanics		

All physics-related students except Theoretical Physicists do two half-unit first year practical skills courses 1240, 1241, which include computing and IT skills elements. For most degrees this is followed by compulsory second and third year practical laboratory and project courses. Students reading for the Theoretical Physics degrees take 1449, Practical Mathematics, in year one and replace second and third year experimental work with theory courses. The second and third years of the BSc and MSci degrees provide for optional courses to develop further and enhance knowledge of a range of physics topics.

Students taking the BSc/MSci programmes involving Medical Physics, in addition to the physics core, take one half-unit Medical Physics course in the first year, two in the second year, two in year 3 and a further 3 in year 4 if on the MSci. Students taking the BSc/MSci programmes in Physics with Space Science do one compulsory space science course in each of the first three years.

The fourth year of the MSci degrees comprises a compulsory research project, and a further five half-unit courses, generally chosen from subjects in the relevant degree specialty. The range of courses available is very wide, and includes some courses taught by staff in physics departments from other London Colleges. To qualify for a given degree name, it is expected that the majority of fourth year courses (including the project) will be from those designated against the relevant degree area. The Physics and Astronomy Programme Tutors will monitor and approve the coherence of the set of choices selected by each student.

1.4 THE CORE FOR ASTRONOMY-RELATED DEGREES

Each of the Astronomy-related degrees is built on a common core of half-unit courses over the first three years of both BSc and MSci programmes, supplemented by degree-variation half-units and options. The core courses are listed in Table 3, and comprise: (i) those underpinning first and second year mathematics 1245, 1246 and 2246 (ii) classical and quantum physics elements in the first year 1224, 1247 and second year 2222, 2228, 2201, and (iii) courses which build up an increasing exposure to topics in astronomy and astrophysics. This starts in the first year with core courses in Physics of the Universe 1102, and Practical Astronomy 1130. These are followed in the second year by Astrophysical Processes: Nebulae to Stars 2112, Practical Astrophysics 2130, leading into core third year courses in Stellar Astrophysics 3134, Extragalactic Astronomy and Cosmology 3136, Astronomical Spectroscopy 3338. (The last course is not core for the joint Astronomy Physics degree.)

TABLE 3: CORE COURSES FOR ASTRONOMY-RELATED DEGREES

YEAR 1	YEAR 2	YEAR 3
1102 Physics of the Universe.	2112 Astrophysical Processes: Nebulae to Stars	3134 The Physics and Evolution of Stars
1228 Thermal Physics	2228 Statistical Thermodynamics	3136 Cosmology and Extragalactic Astronomy
1224 Waves, Optics and Acoustics	2117 Physics of the Solar System	3338 Astronomical Spectroscopy
1130 Practical Skills 1A (Astronomy)	2246 Mathematical Methods III	
1240 Practical Skills 1C (Core Physics)	2222 Quantum Physics	
1245 Mathematical Methods I	2201 Electricity and Magnetism	
1246 Mathematical Methods II	2130 Practical Astrophysics 2A	
1247 Classical Mechanics		

Variations in compulsory courses and option courses distinguish the different degrees. These build on and supplement the Astronomy core programme, providing an exposure to a wide range of topics in classical and modern astronomy and astrophysics.

All astronomy-related students do the half-unit first year practical skills course 1240, which includes a computing and IT skills element. For most degrees this is followed by compulsory second and third year practical astronomy/astrophysics and project courses. The second and third years of the BSc and MSci degrees provide for optional courses to further enhance and enrich students' knowledge of astronomy and astrophysics topics.

The fourth year of the MSci degrees comprises a compulsory research project in astronomy/astrophysics, and a further five half-unit courses, generally chosen from subjects in the relevant degree speciality. A wide range of courses is available, including some taught by staff from other London Colleges.

1.5 COMBINED STUDIES DEGREES

Students taking the Astronomy and Physics combined degree follow a programme of core courses drawn from a blend of the physics-related and astronomy-related cores. In addition to the courses listed in Table 3, 2224 is taken in the second year, while in the third year 3338 is replaced by 3224 and 3226. Normally over the three-year and four-year degrees students study about half of their courses in physics and half in astronomy. As they progress, students can place increasing emphasis on either physics-related or astronomy-related options, depending on their interest and aptitude, especially with regard to practical and project work.

The combined studies degrees in Mathematics & Physics and Mathematics & Astronomy are taught jointly with the Mathematics Department. Students take about half of their courses in each department: in the earlier years of the degrees the courses are governed by the later requirements of each subject. Thus, in the first year Maths/Astronomy and Maths/Physics students take 1102 (Physics of the Universe) and 1228 (Thermal Physics) in the first term and 1224 (Waves, Optics and Acoustics) and 1247 (Classical Mechanics) in the second term: with two mathematics half-units in each term.

1.6 SKILLS TRAINING

1.6.1 Practical Skills and Projects

Practical skills teaching is structured to build up competence and a range of experience such that, on graduation, students are capable of independent work in a variety of situations. Most degree programmes include compulsory practical courses which total two to three units for years 1 to 3. For physics-related degrees these form experimental laboratory courses in the Teaching Laboratories in the Department, whilst for the astronomy-related degrees Practical Astronomy classes are held in the first and third years at the University of London Observatory at Mill Hill (used exclusively by UCL students).

Most students in the third year do a course(s) in experimental work (in physics or astronomy) and a Group Project, which introduces students to the concept and challenges of teamwork within a scientific environment. All MSci students in their fourth year undertake a major research project, which draws upon the wide-ranging research activities in the Department. Students proceeding to the BSc rather than the MSci undertake a full-unit project in their third year.

1.6.2 Computing and Information Technology

All students in their first year take a basic Practical Skills course 1240 which includes training in Windows-based computer skills (Excel, Visual Basic etc.). These are complemented in later years through the introduction of packages for the solution of scientific problems (e.g. Mathematica) and a high-level computer language option.

1.6.3 Communication Skills

An integral part of your degree training is to learn how to get your message across, be it to other scientists or not non-specialists, using a range of written and oral media. To this end, two ‘Effective Communication’ modules are followed by all students pursuing degrees in Physics and Astronomy,

one in each of years 1 (1901) and 2 (2901). Writing skills are developed progressively, building up from short written pieces on scientific topics for both specialist and non-specialist audiences, to longer written reports. Oral presentations start with short talks in first year tutorial groups, and towards the end of the first and second years build up to more formal presentations to larger audiences. As part of these exercises, you will gain increasing abilities in using appropriate software, including that needed to construct and maintain your own personal web page. The skills you build in these modules will be increasingly employed in other courses, and will be particularly useful in the third year Group Project and final year dissertations and presentations.

The marks gained in these modules contribute to your assessment for honours in the third year, at a level equivalent to a half course unit.

Each laboratory/observatory practical course also includes a significant element of communications skills development, through the production of formal reports on experiments and projects.

1.7 DEGREE COURSE-STRUCTURES and OPTIONS

Details of each of the year-by-year course structures for the different BSc and MSci degrees are given in the following section. In addition to the relevant core and compulsory courses, students from year 2 onwards can exercise an increasingly flexible range of option courses (typically one in year 2, (depending on the degree), two in year 3, and five in year 4).

The option courses listed in the following degree descriptions are those most commonly chosen. In addition, and at the discretion of the Physics or Astronomy Programme Tutor, students can exercise a limited choice of courses from other Departments, most frequently the Departments of Science and Technology Studies, Mathematics, or Computer Science.

SECTION 2

PROGRAMME STRUCTURES

PHYSICS F300 BSc (3-year)

Programme Structure

YEAR 1	YEAR 2	YEAR 3
1102 Physics of the Universe	2246 Mathematical Methods III	3224 Nuclear and Particle Physics
1224 Waves, Optics and Acoustics	2222 Quantum Physics	3225 Solid State Physics
1228 Thermal Physics	2224 Atomic & Molecular Physics	3226 Quantum Mechanics
1240 Practical Skills 1C (Core Physics)	2228 Statistical Thermodynamics	3400 Physics Project (1 unit) OR 3440 plus 1 option
1241 Practical Skills 1P (Experimental Physics)	2201 Electricity and Magnetism	
1245 Mathematical Methods I	2440 Practical Physics 2A	3201 Electromagnetic theory
1246 Mathematical Methods II	2441 Practical Physics 2B	3441 Group Project
1247 Classical Mechanics	<i>Option</i>	<i>Option</i>
1901 Developing Effective Communications 1*	2901 Developing Effective Communications 2*	

All courses are half units, unless otherwise stated.

*Compulsory modules (weighted into final assessment for honours). Refer to 1.6.3

Courses available for option selection

YEAR 2	YEAR 3
MATH6202 Mathematics for Physics and Astronomy	3423 Methods of Mathematical Physics
2427 Environmental Physics	3443 Lasers and Modern Optics
	3446 Materials Science
	3459 Scientific Computing using Object Oriented Languages
	3661 Physics of the Earth

PHYSICS F303 MSci (4-year)

Programme Structure

YEAR 1	YEAR 2	YEAR 3	YEAR 4
1102 Physics of the Universe	2246 Mathematical Methods III	3224 Nuclear and Particle Physics	4201 Project (1.5 unit)
1224 Waves, Optics and Acoustics	2222 Quantum Physics	3225 Solid State Physics	
1228 Thermal Physics	2224 Atomic & Molecular Physics	3226 Quantum Mechanics	
1240 Practical Skills 1C (Core Physics)	2228 Statistical Thermodynamics	3440 Experimental Physics	<i>Option</i>
1241 Practical Skills 1P (Experimental Physics)	2201 Electricity and Magnetism	3441 Physics Group Project	<i>Option</i>
1245 Mathematical Methods I	2440 Practical Physics 2A	3201 Electromagnetic theory	<i>Option</i>
1246 Mathematical Methods II	2441 Practical Physics 2B	<i>Option</i>	<i>Option</i>
1247 Classical Mechanics	<i>Option</i>	<i>Option</i>	<i>Option</i>
1901 Developing Effective Communications 1*	2901 Developing Effective Communications 2*		

All courses are half units, unless otherwise stated.

*Compulsory modules (weighted into final assessment for Honours). Refer to 1.6.3

Courses available for option selection

YEAR 2	YEAR 3	YEAR 4
MATH6202 Mathematics for Physics and Astronomy	3423 Methods of Mathematical Physics	<i>See separate</i>
2427 Environmental Physics	3443 Lasers and Modern Optics	<i>table of options for year 4 Page 32</i>
	3446 Materials Science	
	3459 Scientific Computing using Object Oriented Languages	
	3661 Physics of the Earth	

THEORETICAL PHYSICS F340 BSc (3-year).

Programme Structure

YEAR 1	YEAR 2	YEAR 3
1102 Physics of the Universe	2246 Mathematical Methods III	3224 Nuclear and Particle Physics
1224 Waves, Optics and Acoustics	2222 Quantum Physics	3225 Solid State Physics
1228 Thermal Physics	2224 Atomic & Molecular Physics	3226 Quantum Mechanics
1240 Practical Skills 1C (Core Physics)	2228 Statistical Thermodynamics	3441 Group Project
1449 Practical Mathematics 1	2201 Electricity and Magnetism	3201 Electromagnetic Theory
1245 Mathematical Methods I	2443 Practical Mathematics II	<i>Option</i>
1246 Mathematical Methods II	MATH6202 Mathematics for Physics and Astronomy	<i>Option</i>
1247 Classical Mechanics	MATH2301 Fluid Mechanics	<i>Option</i>
1901 Developing Effective Communications 1*	2901 Developing Effective Communications 2*	

All courses are half units, unless otherwise stated.

*Compulsory modules (weighted into final assessment of honours). Refer 1.6.3.

Courses available for option selection

YEAR 3
3423 Methods of Mathematical Physics
3443 Lasers and Modern Optics
MATH2201 Algebra 3: Further Linear Algebra
MATH3305 Mathematics for General Relativity
MATH3306 Cosmology
3400 Project (1 unit)
MATH3303 Gas Dynamics
3459 Scientific Computing using Object Oriented Languages

THEORETICAL PHYSICS F345 MSci (4-year).

Programme Structure

YEAR 1	YEAR 2	YEAR 3	YEAR 4
1102 Physics of the Universe	2246 Mathematical Methods III	3224 Nuclear and Particle Physics	4201 Project (1.5 unit)
1224 Waves, Optics and Acoustics	2222 Quantum Physics	3225 Solid State Physics	
1228 Thermal Physics	2224 Atomic & Molecular Physics	3226 Quantum Mechanics	
1240 Practical Skills 1C (Core Physics)	2228 Statistical Thermodynamics	3441 Physics Group Project	<i>Option</i>
1449 Practical Mathematics 1	2201 Electricity and Magnetism	3201 Electromagnetic Theory	<i>Option</i>
1245 Mathematical Methods I	2443 Practical Mathematics II	<i>Option</i>	<i>Option</i>
1246 Mathematical Methods II	MATH6202 Mathematics for Physics and Astronomy	<i>Option</i>	<i>Option</i>
1247 Classical Mechanics	MATH2301 Fluid Mechanics	<i>Option</i>	<i>Option</i>
1901 Developing Effective Communications 1*	2901 Developing Effective Communications 2*		

All courses are half units, unless otherwise stated.

*Compulsory modules (weighted into final assessment of honours). Refer 1.6.3.

Courses available for option selection

YEAR 3	YEAR 4
3423 Methods of Mathematical Physics	<i>See separate table of options</i>
3443 Lasers and Modern Optics	<i>for Year 4. Page 32</i>
MATH2201 Algebra 3: Further Linear Algebra	<i>plus options from Mathematics</i>
MATH3305 Mathematics for General Relativity	<i>Department</i>
MATH3306 Cosmology	
MATH3303 Gas Dynamics	
3459 Scientific Computing using Object Oriented Languages	

PHYSICS WITH MEDICAL PHYSICS F351 BSc (3-year).

Programme Structure

YEAR 1	YEAR 2	YEAR 3
1224 Waves, Optics and Acoustics	2246 Mathematical Methods III	3224 Nuclear and Particle Physics **
1228 Thermal Physics	2222 Quantum Physics	3225 Solid State Physics **
1240 Practical Skills 1C (Core Physics)	2224 Atomic & Molecular Physics	3226 Quantum Mechanics **
1102 Physics of the Universe	2228 Statistical Thermodynamics	3400 Project (1 unit)
1245 Mathematical Methods I	2201 Electricity and Magnetism	
1246 Mathematical Methods II	2440 Practical Physics 2A	3201 Electromagnetic theory **
1247 Classical Mechanics	2881 Introduction to Medical Radiation Physics	<i>Medical Physics Option</i>
1882 Essential Medical Physics	PHOL1003 Mammalian Physiology	<i>Medical Physics Option</i>
1901 Developing Effective Communications 1*	2901 Developing Effective Communications 2*	

All courses are half units, unless otherwise stated.

*Compulsory modules (weighted into final assessment of honours). Refer 1.6.3.

**One of these Year 3 courses may be replaced by a Medical Physics option.

Courses available for option selection

YEAR 3
3890 Medical Imaging with Ionising Radiation
3891 Medical Imaging with Non-Ionising Radiation
3892 Treatment with Ionising Radiation
COMP3053 Medical Scientific Computing
ELEC3012 Physiological Monitoring
4886 Optics in Medicine
ELEC3009 Medical Electronics

MEDICAL PHYSICS F350 MSci (4-year).

Programme Structure

YEAR 1	YEAR 2	YEAR 3	YEAR 4
1224 Waves, Optics and Acoustics	2246 Mathematical Methods III	3224 Nuclear and Particle Physics **	4201 Project (1.5 unit) (Medical Physics)
1228 Thermal Physics	2222 Quantum Physics	3225 Solid State Physics **	
1240 Practical Skills 1C (Core Physics)	2224 Atomic & Molecular Physics	3226 Quantum Mechanics **	
1102 Physics of the Universe	2228 Statistical Thermodynamics	3440 Experimental Physics (some Medical Physics)	<i>Medical Physics Option</i>
1245 Mathematical Methods I	2201 Electricity and Magnetism	3441 Physics Group Project	<i>Medical Physics Option</i>
1246 Mathematical Methods II	2440 Practical Physics 2A	3201 Electromagnetic Theory **	<i>Medical Physics Option</i>
1247 Classical Mechanics	2881 Introduction to Medical Radiation Physics	<i>Medical Physics Option</i>	<i>Non-Medical Physics Option</i>
1882 Essential Medical Physics	PHOL1003 Mammalian Physiology	<i>Medical Physics Option</i>	<i>Non-Medical Physics Option</i>
1901 Developing Effective Communications 1*	2901 Developing Effective Communications 2*		

All courses are half units, unless otherwise stated.

*Compulsory modules (weighted into final assessment of honours). Refer 1.6.3.

**One of these Year 3 courses may be replaced by a Medical Physics option.

Courses available for option selection

YEAR 3	YEAR 4
COMP3053 Medical Scientific Computing	<i>See separate table of options for Year 4, page 32</i>
3890 Medical Imaging with Ionising Radiation	
3891 Medical Imaging with Non-Ionising Radiation	
3892 Treatment with Ionising Radiation	
ELEC3012 Physiological Monitoring	
4886 Optics in Medicine	
ELEC3009 Medical Electronics	

PHYSICS WITH SPACE SCIENCE F3FN BSc (3-year).

Programme Structure

YEAR 1	YEAR 2	YEAR 3
1224 Waves, Optics and Acoustics	1102 Physics of the Universe	3224 Nuclear and Particle Physics
1228 Thermal Physics	2246 Mathematical Methods III	3225 Solid State Physics
1240 Practical Skills 1C (Core Physics)	2222 Quantum Physics	3226 Quantum Mechanics
1241 Practical Skills 1P (Experimental Physics)	2224 Atomic & Molecular Physics	3400 Project (1 unit)
1245 Mathematical Methods I	2228 Statistical Thermodynamics	
1246 Mathematical Methods II	2201 Electricity and Magnetism	3664 Space Systems Technology
1247 Classical Mechanics	2442 Practical Physics 2C (Space Science)	3201 Electromagnetic Theory
1664 Space Exploration	2665 Space Science, Instrumentation and Techniques	<i>Option</i>
1901 Developing Effective Communications 1*	2901 Developing Effective Communications 2*	

All courses are half units, unless otherwise stated.

*Compulsory modules (weighted into final assessment of honours). Refer 1.6.3.

Courses available for option selection

YEAR 3
3459 Scientific Computing using Object Oriented Languages
3661 Physics of the Earth
2112 Astrophysical Processes: Nebulae to Stars
2117 Physics of the Solar System

PHYSICS WITH SPACE SCIENCE F3FM MSci (4-year).

Programme Structure

YEAR 1	YEAR 2	YEAR 3	YEAR 4
1224 Waves, Optics and Acoustics	1102 Physics of the Universe	3224 Nuclear and Particle Physics	4201 Project (1.5 unit)
1228 Thermal Physics	2246 Mathematical Methods III	3225 Solid State Physics	
1240 Practical Skills 1C (Core Physics)	2222 Quantum Physics	3226 Quantum Mechanics	
1241 Practical Skills 1P (Experimental Physics)	2224 Atomic and Molecular Physics	3440 Experimental Physics	<i>Option</i>
1245 Mathematical Methods I	2228 Statistical Thermodynamics	3441 Physics Group Project	<i>Option</i>
1246 Mathematical Methods II	2201 Electromagnetic Theory	3664 Space Systems Technology	<i>Option</i>
1247 Classical Mechanics	2442 Practical Physics 2C (Space Science)	3201 Electromagnetic theory	<i>Option</i>
1664 Space Exploration	2665 Space Instrumentation and Techniques	<i>Option</i>	<i>Option</i>
1901 Developing Effective Communications 1*	2901 Developing Effective Communications 2*		

All courses are half units, unless otherwise stated.

*Compulsory modules (weighted into final assessment of honours). Refer to 1.6.3.

Courses available for option selection

YEAR 3	YEAR 4
3459 Scientific Computing using Object Oriented Languages	<i>See separate table of options for Year 4, Page 32.</i>
3661 Physics of the Earth	
2112 Astrophysical Processes: Nebulae to Stars	
2117 Physics of the Solar System	

ASTRONOMY F500 BSc (3-year).

Programme Structure

YEAR 1	YEAR 2	YEAR 3
1228 Thermal Physics	2112 Astrophysical Processes: Nebulae to Stars	3134 The Physics and Evolution of Stars
1102 Physics of the Universe	2228 Statistical Thermodynamics	3136 Cosmology and Extragalactic Astronomy
1224 Waves, Optics and Acoustics	2117 Physics of the Solar System	3301 Techniques and Optics in Astronomy
1130 Practical Skills 1A (Astronomy)	2246 Mathematical Methods III	3338 Astronomical Spectroscopy
1240 Practical Skills 1C (Core Physics)	2222 Quantum Physics	3330 Practical Astronomy 1 - Techniques
1245 Mathematical Methods I	2201 Electricity and Magnetism	3331 Practical Astronomy 2 - Applications OR 3332 Practical Astronomy 3 - Field Trip
1246 Mathematical Methods II	2130 Practical Astrophysics 2A	<i>Option</i>
1247 Classical Mechanics	<i>Option</i>	<i>Option</i>
1901 Developing Effective Communications 1*	2901 Developing Effective Communications 2*	

All courses are half units, unless otherwise stated

*Compulsory modules (weighted into final assessment of honours). Refer to 1.6.3.

Courses available for option selection

YEAR 2	YEAR 3
2427 Environmental Physics	3423 Methods of Mathematical Physics
MATH6202 Mathematics for Physics & Astronomy	3224 Nuclear and Particle Physics
	3226 Quantum Mechanics
	3459 Scientific Computing using Object Oriented Languages
	3661 Physics of the Earth
	3333 Interstellar Physics
	GEOL3027 Astrobiology
	3201 Electromagnetic Theory

ASTRONOMY F502 MSci (4-year).

Programme Structure

YEAR 1	YEAR 2	YEAR 3	YEAR 4
1228 Thermal Physics	2112 Astrophysical Processes: Nebulae to Stars	3134 The Physics and Evolution of Stars	4101 Astronomy Project (1.5 unit)
1102 Physics of the Universe	2228 Statistical Thermodynamics	3136 Cosmology and Extragalactic Astronomy	
1224 Waves, Optics and Acoustics	2117 Physics of the Solar System	3301 Techniques and Optics in Astronomy	
1130 Practical Skills 1A (Astronomy)	2246 Mathematical Methods III	3338 Astronomical Spectroscopy	<i>Option</i>
1240 Practical Skills 1C (Core Physics)	2222 Quantum Physics	3330 Practical Astronomy 1 - Techniques	<i>Option</i>
1245 Mathematical Methods I	2201 Electricity and Magnetism	3331 Practical Astronomy 2 - Applications OR 3332 Practical Astronomy 3 - Field Trip	<i>Option</i>
1246 Mathematical Methods II	2130 Practical Astrophysics 2A	<i>Option</i>	<i>Option</i>
1247 Classical Mechanics	<i>Option</i>	<i>Option</i>	<i>Option</i>
1901 Developing Effective Communications 1*	2901 Developing Effective Communications 2*		

All courses are half units, unless otherwise stated.

*Compulsory modules (weighted into final assessment of honours). Refer to 1.6.3.

Courses available for option selection

YEAR 2	YEAR 3	YEAR 4
2427 Environmental Physics	3423 Methods of Mathematical Physics	<i>See</i>
MATH6202 Mathematics for Physics & Astronomy	3224 Nuclear and Particle Physics	<i>Option table</i>
	3226 Quantum Mechanics	
	3459 Scientific Computing using Object Oriented Languages	<i>For year 4, Page 32.</i>
	3661 Physics of the Earth	
	3333 Interstellar Physics	
	GEOL3027 Astrobiology	
	3201 Electromagnetic Theory	

ASTRONOMY AND PHYSICS FF53 BSc (3-year).

Programme Structure

YEAR 1		YEAR 2	YEAR 3
1228 Thermal Physics		2112 Astrophysical Processes: Nebulae to Stars	3224 Nuclear and Particle Physics
1102 Physics of the Universe		2228 Statistical Thermodynamics	3226 Quantum Mechanics
1224 Waves, Optics and Acoustics		2117 Physics of the Solar System	3134 The Physics and Evolution of Stars
1130 Practical Skills 1A (Astronomy) OR	1241 Practical Skills 1P (Experimental Physics)	2246 Mathematical Methods III	3136 Cosmology and Extragalactic Astronomy
1240 Practical Skills 1C		2222 Quantum Physics	3330 Practical Astronomy 1 - Techniques
1245 Mathematical Methods I		2224 Atomic and Molecular Physics	3331 Practical Astronomy 2 - Applications OR 3332 Practical Astronomy 3 - Field Trip OR 3441 Physics Group Project
1246 Mathematical Methods II		2201 Electricity and Magnetism	<i>Option</i>
1247 Classical Mechanics		2130 Practical Astrophysics 2A	<i>Option</i>
1901 Developing Effective Communications 1*		2901 Developing Effective Communications 2*	

All courses are half units, unless otherwise stated.

*Compulsory modules (weighted into final assessment of honours). Refer 1.6.3.

Courses available for option selection

YEAR 3
3225 Solid State Physics
3333 Interstellar Physics
3338 Astronomical Spectroscopy
3459 Scientific Computing using Object Oriented Languages
3661 Physics of the Earth
3301 Techniques and Optics in Modern Astronomy
GEOL3027 Astrobiology
3201 Electromagnetic Theory

ASTRONOMY AND PHYSICS FF3M MSci (4-year).

Programme Structure

YEAR 1		YEAR 2	YEAR 3		YEAR 4
1228 Thermal Physics		2112 Astrophysical Processes: Nebulae to Stars	3224 Nuclear and Particle Physics		4101 Astronomy Project (1.5units)
1102 Physics of the Universe		2228 Statistical Thermodynamics	3226 Quantum Mechanics		
1224 Waves, Optics and Acoustics		2117 Physics of the Solar System	3134 The Physics and Evolution of Stars		
1130 Practical Skills 1A (Astronomy) OR	1241 Skills 1P (Experimental Physics)	2246 Mathematical Methods III	3136 Cosmology and Extragalactic Astronomy		<i>Option</i>
1240 Practical Skills 1C (Core Physics)		2222 Quantum Physics	3330 Practical Astronomy 1 Techniques OR	3440 Experimental Physics	<i>Option</i>
1245 Mathematical Methods I		2224 Atomic and Molecular Physics	3331 Practical Astronomy 2 Applications OR 3332 (3C32) Practical Astronomy 3 - Field Trip	3441 Physics Group Project	<i>Option</i>
1246 Mathematical Methods II		2201 Electricity and Magnetism	<i>Option</i>		<i>Option</i>
1247 Classical Mechanics		2130 Practical Astrophysics 2A	<i>Option</i>		<i>Option</i>
1901 Developing Effective Communications 1*		2901 Developing Effective Communications 2*			

All courses are half units, unless otherwise stated.

*Compulsory modules (weighted into final assessment of honours). Refer 1.6.3.

Courses available for option selection

YEAR 3 (continued on next page)	YEAR 4
3225 Solid State Physics	
3333 Interstellar Physics	<i>See Separate table</i>
3338 Astronomical Spectroscopy	<i>of options for year 4,</i>

3459 Scientific Computing using Object Oriented Languages	<i>Page 32.</i>
3661 Physics of the Earth	
C3301 Techniques and Optics in Modern Astronomy	
GEOL3027 Astrobiology	
3201 Electromagnetic Theory	

ASTROPHYSICS F510 BSc (3-year).

Programme Structure

YEAR 1	YEAR 2	YEAR 3
1228 Thermal Physics	2222 Quantum Physics	3338 Astronomical Spectroscopy
1102 Physics of the Universe	2112 Astrophysical Processes: Nebulae to Stars	3134 The Physics and Evolution of Stars
1224 Waves, Optics and Acoustics	2228 Statistical Thermodynamics	3136 Cosmology and Extragalactic Astronomy
1130 Practical Skills 1A (Astronomy)	2117 Physics of the Solar System	3333 Interstellar Physics
1240 Practical Skills 1C (Core Physics)	2246 Mathematical Methods III	3330 Practical Astronomy 1 - Techniques
1245 Mathematical Methods I	2201 Electricity and Magnetism	3331 Practical Astronomy 2 - Applications OR 3332 Practical Astronomy 3 - Field Trip OR 3441 Physics Group Project
1246 Mathematical Methods II	2130 Practical Astrophysics 2A	<i>Option</i>
1247 Classical Mechanics	MATH6202 Mathematics for Physics & Astronomy	<i>Option</i>
1901 Developing Effective Communications 1*	2901 Developing Effective Communications 2*	

All courses are half units, unless otherwise stated.

*Compulsory modules (weighted into final assessment of honours). Refer 1.6.3.

Courses available for option selection

YEAR 3
3423 Methods of Mathematical Physics
3226 Quantum Mechanics
3301 Techniques and Optics in Modern Astronomy
3459 Scientific Computing using Object Oriented Languages
3661 Physics of the Earth
GEOL3027 Astrobiology
3224 Nuclear and Particle Physics
3201 Electromagnetic Theory

ASTROPHYSICS F511 MSci (4-year).

Programme Structure

YEAR 1	YEAR 2	YEAR 3	YEAR 4
1228 Thermal Physics	2222 Quantum Physics	3333 Interstellar Physics	4101 Astronomy Project (1.5 unit)
1102 Physics of the Universe	2112 Astrophysical Processes: Nebulae to Stars	3134 The Physics and Evolution of Stars	
1224 Waves, Optics and Acoustics	2228 Statistical Thermodynamics	3136 Cosmology and Extragalactic Astronomy	
1130 Practical Skills 1A (Astronomy)	2117 Physics of the Solar System	3338 Astronomical Spectroscopy	<i>Option</i>
1240 Practical Skills 1C (Core Physics)	2246 Mathematical Methods III	3330 Practical Astronomy 1 - Techniques OR 3440 Experimental Physics	<i>Option</i>
1245 Mathematical Methods I	2201 Electricity and Magnetism	3331 Practical Astronomy 2 - Applications OR 3332 Practical Astronomy 3 - Field Trip OR 3441 Physics Group Project	<i>Option</i>
1246 Mathematical Methods II	2130 Practical Astrophysics 2A	<i>Option</i>	<i>Option</i>
1247 Classical Mechanics	MATH6202 Mathematics for Physics & Astronomy	<i>Option</i>	<i>Option</i>
1901 Developing Effective Communications 1*	2901 Developing Effective Communications 2*		

All courses are half units, unless otherwise stated.

*Compulsory modules (weighted into final assessment of honours). Refer to 1.6.3.

Courses available for option selection

YEAR 3 (continued on next page)	YEAR 4
3423 Methods of Mathematical Physics	
3226 Quantum Mechanics	
3301 Techniques and Optics in Modern Astronomy	
3459 Scientific Computing using Object Oriented Languages	<i>See separate table of options for Year 4, Page 32</i>

3661 Physics of the Earth	
GEOL3027 Astrobiology	
3224 Nuclear and Particle Physics	
3201 Electromagnetic Theory	

MATHEMATICS AND PHYSICS GF13 BSc (3-year).

Programme Structure

YEAR 1	YEAR 2	YEAR 3
1102 Physics of the Universe	2222 Quantum Physics	3224 Nuclear and Particle Physics
1224 Waves, Optics and Acoustics	2224 Atomic & Molecular Physics	3225 Solid State Physics
1228 Thermal Physics	2228 Statistical Thermodynamics	3226 Quantum Mechanics
1247 Classical Mechanics	2201 Electricity and Magnetism	3201 Electromagnetic Theory
MATH1101 Analysis 1	MATHM2101 Analysis 3 : Complex Analysis	<i>Option</i>
MATH1401 Mathematical Methods 1	MATHM2401 Mathematical Methods 3	<i>Option</i>
MATH1402 Mathematical Methods II	<i>Option</i>	<i>Option</i>
MATH1203 Algebra for Joint Honours	<i>Option</i>	<i>Option</i>

All courses are half units, unless otherwise stated.

Courses available for option selection

YEAR 2	YEAR 3
MATH2302 Analytic Dynamics	2112 Astrophysical Processes: Nebulae to Stars
MATH2402 Mathematical Methods 4	2427 Environmental Physics
MATH2501 Probability and Statistics	3661 Physics of the Earth
	MATH2201 Algebra 3: Further Linear Algebra
	MATH2301 Fluid Dynamics
	Other Mathematics options

MATHEMATICS AND PHYSICS GF1H MSci (4-year).

Programme Structure

YEAR 1	YEAR 2	YEAR 3	YEAR 4
1102 Physics of the Universe	2222 Quantum Physics	3224 Nuclear and Particle Physics	4201 Physics Project (1.5 unit) OR MATH4901 Maths Project (1 unit) plus an <i>Option</i>
1224 Waves, Optics and Acoustics	2224 Atomic & Molecular Physics	3225 Condensed Matter Physics	
1228 Thermal Physics	2228 Statistical Thermodynamics	3226 Quantum Mechanics	
1247 Classical Mechanics	2201 Electricity and Magnetism	MATH2201 Algebra 3: Further Linear Algebra	<i>Option</i>
MATH1101 Analysis 1	MATH2101 Analysis 3: Complex Analysis	MATH2301 Fluid Dynamics	<i>Option</i>
MATH1401 Mathematical Methods 1	MATH2401 Mathematical Methods 3	3201 Electromagnetic Theory	<i>Option</i>
MATH1402 Mathematical Methods 2	<i>Option</i>	<i>Option</i>	<i>Option</i>
MATH1203 Algebra for Joint Honours	<i>Option</i>	<i>Option</i>	<i>Option</i>

All courses are half units, unless otherwise stated.

Courses available for option selection

YEAR 2	YEAR 3	YEAR 4
MATH2302 Analytical Dynamics	2112 Astrophysical Processes: Nebulae to Stars	<i>See separate table of Options on Page 32 for year 4</i>
MATH2402 Mathematical Methods 4	2427 Environmental Physics	
MATH2501 Probability and Statistics	3661 Physics of the Earth	
	M332: Algebra 2	
	Other Mathematics Options	

MATHS AND ASTRONOMY GF15 BSc (3-year).

Programme Structure

YEAR 1	YEAR 2	YEAR 3
1228 Thermal Physics	2112 Astrophysical Processes: Nebulae to Stars	3136 Cosmology and Extragalactic Astronomy
1102 Physics of the Universe	2228 Statistical Thermodynamics	3134 The Physics and Evolution of Stars
1224 Waves, Optics and Acoustics	2222 Quantum Physics	<i>Option</i>
1247 Classical Mechanics	2201 Electricity and Magnetism	<i>Option</i>
MATH1101) Analysis 1	MATH2101 Analysis 3: Complex Analysis	<i>Option</i>
MATH1401 Mathematical Methods 1	MATH2401 Mathematical Methods 3	<i>Option</i>
MATH1402 Mathematical Methods 2	<i>Option</i>	<i>Option</i>
MATH1203 Algebra for Joint Honours	<i>Option</i>	<i>Option</i>

All courses are half units, unless otherwise stated

Courses available for option selection

YEAR 2	YEAR 3
1130 Practical Skills 1A (Astronomy)	3333 Interstellar Physics
2117 Physics of the Solar System	3338 Astronomical Spectroscopy
MATH2301 Fluid Dynamics	3459 Scientific Computing using Object Oriented Languages
MATH2402 Mathematical Methods 4	MATH2102 Analysis 4: Real Analysis
MATH2501 Probability and Statistics	3224 Nuclear and Particle Physics
MATH2302 Analytical Dynamics	3201 Electromagnetic Theory

MATHS AND ASTRONOMY GF1M MSci (4-year).

Programme Structure

YEAR 1	YEAR 2	YEAR 3	YEAR 4
1228 Thermal Physics	2112 Astrophysical Processes: Nebulae to Stars	3134 The Physics and Evolution of Stars	4101 Astronomy Project (1.5 unit) OR MATH4901 Maths Project (1 unit) plus an <i>Option</i>
1102 Physics of the Universe	2228 Statistical Thermodynamics	3136 Cosmology and Extragalactic Astronomy	
1224 Waves, Optics and Acoustics	2222 Quantum Physics	MATH2102 Analysis 4: Real Analysis	
1247 Classical Mechanics	2201 Electricity and Magnetism	MATH2201 Algebra 3: Further Linear Algebra	<i>Option</i>
MATH1101 Analysis 1	MATH2101 Analysis 3: Complex Analysis	MATH2301 Fluid Dynamics	<i>Option</i>
MATH1401 Mathematical Methods 1	MATH2401 Mathematical Methods 3	<i>Option</i>	<i>Option</i>
MATH1402 Mathematical Methods 2	<i>Option</i>	<i>Option</i>	<i>Option</i>
MATH1203 Algebra for Joint Honours	<i>Option</i>	<i>Option</i>	<i>Option</i>

All courses are half units, unless otherwise stated.

Courses available for option selection

YEAR 2	YEAR 3	YEAR 4
1130 Practical Skills 1A (Astronomy)	3301 Techniques and Optics in Modern Astronomy	<i>See</i>
2117 Physics of the Solar System	3333 Interstellar Physics	<i>separate</i>
MATH2402 Mathematical Methods 4	3338 Astronomical Spectroscopy	<i>table of</i>
MATH2501 Probability and Statistics	3459 Scientific Computing using Object Oriented Languages	<i>options for</i>
MATH2302 Analytical Dynamics	3224 Nuclear and Particle Physics	<i>year 4</i> <i>page 32</i>

Course Options for 4th Year MSci, all degrees. (Read the notes below the table pertaining to possible choices of courses depending on degree programme.)

All courses are half units

UCL Mainly astronomy-related	UCL Mainly physics-related	UCL Mainly medical physics
3333 Interstellar Physics	4426 Advanced Quantum Theory	COMP3053 Medical Scientific Computing
4312 Planetary Atmospheres	4421 Atom and Photon Physics	4886 Optics in Medicine
4314 Solar Physics	4431 Molecular Physics	3890 Medical Imaging with Ionising Radiation
4315 High Energy Astrophysics	4442 Particle Physics	3891 Medical Imaging with Non-Ionising Radiation
4316 Advanced Topics in Stellar Atmospheres and Evolution	4427 Quantum Computation and Communication	3892 Treatment using Ionising Radiation
4317 Galaxy and Cluster Dynamics	4472 Order and Excitations in Condensed Matter	ELEC3012 Physiological Monitoring
MATH3305 Mathematics for General Relativity	3423 Methods of Mathematical Physics	ELEC3009 Medical Electronics 1
MATH3306 Cosmology	4465 Space Plasma and Magnetospheric Physics	Other Colleges Mainly physics-related
3301 Techniques and Optics in Astronomy	3661 Physics of the Earth	4261 Electromagnetic Theory (QMUL)
Other Colleges Mainly astronomy-related	3443 Lasers and Modern optics	4478 Superfluids, Superconductors & Condensates (RHUL)
4600 Stellar Structure and evolution (QMUL) (taught in the evenings)	3446 Material Science	4512 Nuclear Magnetic Resonance (Taught at RHUL Egham campus)
4601 Advanced Cosmology (QMUL)		4515 Computing and Statistical data analysis (Taught at RHUL Egham campus)
4603 Astrophysical Fluid Dynamics (QMUL)		4750 Image Capture and Sensor Technology (KCL)
4650 Solar System (QMUL) (taught in the evenings)		4211 Statistical Mechanics (RHUL)
4660 The Galaxy (QMUL) (taught in the evenings)		4242 Relativistic Waves and Quantum fields. (QMUL)
4670 Astrophysical Plasmas (QMUL) (taught in the evenings)		4474 Physics at the Nano-scale (KCL)

Physics students normally take the majority of options from the physics-related courses.

Theoretical Physics students normally take the majority of options from the physics-related courses.

Medical Physics students normally select 3 medical physics options plus 2 options from the physics-related courses.

Physics with Space Science students normally take the majority of options from the physics-related courses.

Astronomy students normally take the majority of options from the astronomy-related courses.

(Continued over page)

Astronomy and Physics students normally take at least 2 options from the physics-related courses and at least 2 from the astronomy-related courses.

Astrophysics students take at least 3 from options from the astronomy-related courses.

Maths and Physics students normally take about half their options from the physics-related courses and half from the options offered by the Maths Dept.

Maths and Astronomy students normally take about half their options from the astronomy-related courses and half from the options offered by the Maths Dept.