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

**SESSION 2013/2014**

**Dates of College Terms**

The College terms for session 2013/2014 are:

**First Term:**
Monday, 23 September 2013 – Friday, 13 December 2013 - (12 weeks)

**Second Term:**
Monday, 13 January 2014 – Friday, 28 March 2014 - (11 weeks)

**Third Term:**
Tuesday, 28 April 2014 – Friday, 13 June 2014 - (7 weeks)

**Reading weeks begin**
Term 1 – 4 November 2013
Term 2 – 17 February 2014

***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 2013/2014. 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** – provides details of the 4th Year Intercollegiate MSci courses.

Detailed syllabuses and course descriptions are given in the handbooks of '*Course Descriptions*' prepared for each year.

Timetables for all courses can be found on the Central timetable website www.ucl.ac.uk/timetable

If you need guidance on your choice of course(s), please contact the Programme Tutor, Dr Stan Zochowski (s.zochowski@ucl.ac.uk).

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**SECTION 1**

## 1. FULL-TIME UNDERGRADUATE DEGREE PROGRAMMES

### 1.1 Overview

The four-year integrated masters 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. 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. 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, MSc postgraduate programme.

**TABLE 1: Full-Time Undergraduate Degree programmes**

| Title of Programme | BSc UCAS Code | MSci UCAS Code |
|---|---|---|
| **Single Honours** | | |
| Physics | F300 | F303 |
| Theoretical Physics | F340 | F345 |
| Astrophysics | F510 | F511 |
| **Combined Honours** | | |
| Mathematics and Physics (This course is run by the Maths dept) | GF13 | GF1H |

### 1.2 Aims and Objectives

The general teaching **aim** of the Department is to deliver a 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.

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 approximately 188 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 three 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). 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 statistical thermodynamics 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 |
|---|---|---|
| 1202 Atoms, Stars and The Universe | 2201 Electricity and Magnetism | 3201 Electromagnetic Theory |
| 1224 Waves, Optics and Acoustics | 2222 Quantum Physics | 3224 Nuclear and Particle Physics |
| 1228 Thermal Physics | 2224 Atomic & Molecular Physics | 3225 Solid State Physics |
| 1240 Practical Skills 1C (Core Physics) | 2228 Statistical Thermodynamics | 3226 Quantum Physics |
| 1245 Mathematical Methods I | 2246 Mathematical Methods III | |
| 1246 Mathematical Methods II | | |
| 1247 Classical Mechanics | | |

All Physics students 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 1240 and 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.

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 Tutor and the Astronomy & Theoretical Physics Tutor 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 is 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 Atoms, Stars and The Universe 1202, 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 the Physics of Stars 3135, Physical Cosmology 3137 and Astronomical Spectroscopy 3338.

**TABLE 3: CORE COURSES FOR ASTROPHYSICS RELATED DEGREES**

| YEAR 1 | YEAR 2 | YEAR 3 |
|---|---|---|
| 1130 Practical Skills 1A (Astronomy) | 2112 Astrophysical Processes: Nebulae to Stars | 3135 The Physics of Stars |
| 1202 Atoms, Stars and The Universe. | 2117 Physics of the Solar System | 3137 Physical Cosmology |
| 1224 Waves, Optics and Acoustics | 2130 Practical Astrophysics 2A | 3338 Astronomical Spectroscopy |
| 1228 Thermal Physics | 2201 Electricity and Magnetism | |
| 1240 Practical Skills 1C (Core Physics) | 2222 Quantum Physics | |
| 1245 Mathematical Methods I | 2228 Statistical Thermodynamics | |
| 1246 Mathematical Methods II | 2246 Mathematical Methods III | |
| 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 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 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 SKILLS TRAINING

### 1.5.1 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.

Most students in the third year do a course 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 may possible undertake a full-unit project in their third year.

### 1.5.2 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. These are complemented in later years through the introduction of packages for the solution of scientific problems (e.g. Matlab) and a high-level computer language option.

### 1.5.3 Communication Skills

An integral part of your degree training is to learn how to get your message across, be it to other scientists or 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 (PHAS1901) and 2 (PHAS2901). 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 and fourth year, at a level equivalent to approximately 2% for each module.

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

## 1.6 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 or three 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 Medical Physics and Bioengineering.

# SECTION 2

# PROGRAMME STRUCTURES

**PHYSICS F300 BSc (3-year) -- (UBSPHYSING05)**

**Programme Structure**

| YEAR 1 | YEAR 2 | YEAR 3 |
|---|---|---|
| 1202 Atoms, Stars and The Universe | 2201 Electricity and Magnetism | 3201 Electromagnetic theory |
| 1224 Waves, Optics and Acoustics | 2222 Quantum Physics | 3224 Nuclear and Particle Physics |
| 1228 Thermal Physics | 2224 Atomic & Molecular Physics | 3225 Solid State Physics |
| 1240 Practical Skills 1C (Core Physics) | 2228 Statistical Thermodynamics | 3226 Quantum Mechanics |
| 1241 Practical Skills 1P (Experimental Physics) | 2440 Practical Physics 2A | 3400 Physics Project (1 unit) *OR* 3440 plus 1 extra option |
| 1245 Mathematical Methods I | 2441 Practical Physics 2B | |
| 1246 Mathematical Methods II | 2246 Mathematical Methods III | 3441 Group Project |
| 1247 Classical Mechanics | *Option* | *Option* |
| 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 | 3424 Theory of Dynamical Systems | |
| 2427 Environmental Physics | 3443 Lasers and Modern Optics | |
| 2117 Physics of the Solar System | 3447 Materials & Nanomaterials | 3137 Physical Cosmology |
| | 3459 Scientific Computing using Object Oriented Languages | |
| | 3427 Energy & Climate | |
| | 3661 Physics of the Earth | |
| | GEOL3039 Physics of Oceans, Ice Sheets and Climate (1 cu) | |

**PHYSICS F303 MSci (4-year) -- (UMSPHYSING05)**

**Programme Structure**

| YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 |
|---|---|---|---|
| 1202 Atoms Stars and The Universe | 2201 Electricity and Magnetism | 3201 Electromagnetic theory | M201 Project (1.5 unit) |
| 1224 Waves, Optics and Acoustics | 2222 Quantum Physics | 3224 Nuclear and Particle Physics | |
| 1228 Thermal Physics | 2224 Atomic & Molecular Physics | 3225 Solid State Physics | |
| 1240 Practical Skills 1C (Core Physics) | 2228 Statistical Thermodynamics | 3226 Quantum Mechanics | *Option(M level)* |
| 1241 Practical Skills 1P (Experimental Physics) | 2440 Practical Physics 2A | 3440 Experimental Physics | *Option(M level)* |
| 1245 Mathematical Methods I | 2441 Practical Physics 2B | 3441 Group Project | *Option(M level)* |
| 1246 Mathematical Methods II | 2246 Mathematical Methods III | *Option* | *Option* |
| 1247 Classical Mechanics | *Option* | *Option* | *Option* |
| 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 | 3424 Theory of Dynamical Systems | | *See Separate table of Options for year 4 Page 24.* |
| 2427 Environmental Physics | 3443 Lasers and Modern Optics | | |
| 2117 Physics of the Solar System | 3447 Materials & Nanomaterials | | |
| | 3459 Scientific Computing using Object Oriented Languages | | |
| | 3427 Energy and Climate | 3137 Physical Cosmology | |
| | 3661 Physics of the Earth | | |
| | GEOL3039 Physics of Oceans,Ice Sheets and Climate(1 cu) | | |

**THEORETICAL PHYSICS F340 BSc (3-year) -- (UBSPHYSTPH05)**

**Programme Structure**

| YEAR 1 | YEAR 2 | YEAR 3 |
|---|---|---|
| 1202 Atoms, Stars and The Universe | 2201 Electricity and Magnetism | 3201 Electromagnetic Theory |
| 1224 Waves, Optics and Acoustics | 2222 Quantum Physics | 3224 Nuclear and Particle Physics |
| 1228 Thermal Physics | 2224 Atomic & Molecular Physics | 3225 Solid State Physics |
| 1240 Practical Skills 1C (Core Physics) | 2228 Statistical Thermodynamics | 3226 Quantum Mechanics |
| 1245 Mathematical Methods I | 2246 Mathematical Methods III | 3441 Group Project |
| 1246 Mathematical Methods II | 2423 Mathematical methods for Theoretical Physics | *Option* |
| 1247 Classical Mechanics | 2443 Practical Mathematics II | *Option* |
| 1449 Practical Mathematics 1 | MATH6202 Mathematics for Physics and Astronomy | *Option* |
| 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 | |
|---|---|
| 3424 Theory of Dynamical Systems | |
| 3443 Lasers and Modern Optics | 3137 Physical Cosmology |
| 3427 Energy & Climate | |
| MATH2301 Fluid Mechanics | |
| MATH3305 Mathematics for General Relativity | |
| GEOL3039 Physics of Oceans, Ice Sheets and Climate (1 cu) Term 1 and 2. | |
| 3459 Scientific Computing using Object Oriented Languages | |
| 3400 Project (1 unit) | |

**THEORETICAL PHYSICS F345 MSci (4-year) -- (UMSPHYSTPH05)**

**Programme Structure**

| YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 |
|---|---|---|---|
| 1202 Atoms, Stars and The Universe | 2201 Electricity and Magnetism | 3201 Electromagnetic Theory | M201 Project (1.5 unit) |
| 1224 Waves, Optics and Acoustics | 2222 Quantum Physics | 3224 Nuclear and Particle Physics | |
| 1228 Thermal Physics | 2224 Atomic & Molecular Physics | 3225 Solid State Physics | |
| 1240 Practical Skills 1C (Core Physics) | 2228 Statistical Thermodynamics | 3226 Quantum Mechanics | *Option (M level)* |
| 1245 Mathematical Methods I | 2246 Mathematical Methods III | 3441 Group Project | *Option (M level)* |
| 1246 Mathematical Methods II | 2423 Mathematical methods for Theoretical Physics | *Option* | *Option (M level)* |
| 1247 Classical Mechanics | 2443 Practical Mathematics II | *Option* | *Option* |
| 1449 Practical Mathematics 1 | MATH6202 Mathematics for Physics and Astronomy | *Option* | *Option* |
| 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 |
|---|---|---|
| 3424 Theory of Dynamical Systems | 3137 Physical Cosmology | *See separate table of options for Year 4. Page 24.* |
| 3427 Energy & Climate | | |
| 3443 Lasers and Modern Optics | | |
| MATH2301 Fluid Mechanics | | |
| MATH3305 Mathematics for General Relativity | | |
| 3459 Scientific Computing using Object Oriented Languages | | |
| GEOL3039 Physics of Oceans, Ice Sheets and Climate (1 cu) Term 1 and 2. | | |

**ASTROPHYSICS F510 BSc (3-year) -- (UBSASTSPHY05)**

**Programme Structure**

| YEAR 1 | YEAR 2 | YEAR 3 |
|---|---|---|
| 1130 Practical Skills 1A (Astronomy) | 2201 Electricity and Magnetism | 3330 Practical Astronomy 1 - Techniques |
| 1202 Atoms, Stars and The Universe | 2112 Astrophysical Processes: Nebulae to Stars | 3135 The Physics of Stars |
| 1224 Waves, Optics and Acoustics | 2117 Physics of the Solar System | 3137 Physical Cosmology |
| 1228 Thermal Physics | 2130 Practical Astrophysics 2A | 3334 Interstellar Physics |
| 1240 Practical Skills 1C (Core Physics) | 2222 Quantum Physics | 3338 Astronomical Spectroscopy |
| 1245 Mathematical Methods I | 2228 Statistical Thermodynamics | 3331 Practical Astronomy 2 - Applications OR<br>3332 Practical Astronomy 3 - Field Trip OR<br>3441 Physics Group Project |
| 1246 Mathematical Methods II | 2246 Mathematical Methods III | *Option* |
| 1247 Classical Mechanics | *Option* | *Option* |
| 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 2 | YEAR 3 |
|---|---|
| MATH6202 Mathematics for Physics & Astronomy | GEOL3039 Physics of Oceans, Ice Sheets and Climate (1 cu) Term 1 and 2 |
| 08GL064U Astrobiology (evening course taught at Birkbeck) | 3201 Electromagnetic Theory |
| 2427 Environmental Physics | 3224 Nuclear and Particle Physics |
| | 3226 Quantum Mechanics |
| | 3424 Theory of Dynamical Systems |
| | 3427 Energy & Climate |
| | 3459 Scientific Computing using Object oriented Languages |
| | 3661 Physics of the Earth |

**ASTROPHYSICS F511 MSci (4-year) -- (UMSASTSPHY05)**

**Programme Structure**

| YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 |
|---|---|---|---|
| 1130 Practical Skills 1A (Astronomy) | 2201 Electricity and Magnetism | 3135 The Physics of Stars | M101 Astrophysics Project (1.5 unit) |
| 1202 Atoms, Stars and The Universe | 2112 Astrophysical Processes: Nebulae to Stars | 3137 Physical Cosmology | |
| 1224 Waves, Optics and Acoustics | 2117 Physics of the Solar System | 3334 Interstellar Physics | |
| 1228 Thermal Physics | 2130 Practical Astrophysics 2A | 3338 Astronomical Spectroscopy | *Option (M level)* |
| 1240 Practical Skills 1C (Core Physics) | 2222 Quantum Physics | 3330 Practical Astronomy 1 - Techniques<br>OR<br>3440 Experimental Physics | *Option (M level)* |
| 1245 Mathematical Methods I | 2228 Statistical Thermodynamics | 3331 Practical Astronomy 2 - Applications OR<br>3332 Practical Astronomy 3 - Field Trip OR<br>3441 Physics Group Project | *Option (M level)* |
| 1246 Mathematical Methods II | 2246 Mathematical Methods III | *Option* | *Option* |
| 1247 Classical Mechanics | *Option* | *Option* | *Option* |
| 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 |
|---|---|---|
| MATH6202 Mathematics for Physics & Astronomy | GEOL3039 Physics of Oceans, Ice Sheets and Climate (1 cu) Term 1 and 2 | *See Separate table of Options on Page 24 at year 4 level* |
| 08GL064U Astrobiology | 3424 Theory of Dynamical Systems | |
| 2427 Environmental Physics | 3427 Energy & Climate | |
| | 3226 Quantum Mechanics | |
| | 3201 Electromagnetic Theory | |
| | 3224 Nuclear and Particle Physics | |
| | 3661 Physics of the Earth | |
| | 3459 Scientific Computing using Object oriented Languages | |

**MATHEMATICS AND PHYSICS GF13 BSc (3-year).**

**Programme Structure**

| YEAR 1 | YEAR 2 | YEAR 3 |
|---|---|---|
| 1202 Atoms, Stars and 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 | MATH2101 Analysis 3: Complex Analysis | MATH2301 Fluid Mechanics |
| MATH1401 Mathematical Methods 1 | MATH2401 Mathematical Methods 3 | *Option* |
| MATH1402 Mathematical Methods II | *Option* | *Option* |
| MATH1203 Algebra for Joint Honours | *Option* | *Option* |

All courses are half units, unless otherwise stated.
It will be necessary for 1st year to attend the 5-6 lectures on Special Relativity in PHAS1246.

**Courses available for option selection**

| YEAR 2 | YEAR 3 |
|---|---|
| MATH7302 Analytic Dynamics | 2112 Astrophysical Processes: Nebulae to Stars |
| MATH7402 Mathematical Methods 4 | 2427 Environmental Physics |
| MATH7501 Probability and Statistics | 3427 Energy & Climate |
| | 3661 Physics of the Earth |
| | MATH2201 Algebra 3: Further Linear Algebra |
| | 3459 Scientific Computing using Object oriented Languages |
| | Other Mathematics options are possible. See Maths dept list. |

**MATHEMATICS AND PHYSICS GF1H MSci (4-year).**

**Programme Structure**

| YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 |
|---|---|---|---|
| 1202 Atoms, Stars and The Universe | 2222 Quantum Physics | 3224 Nuclear and Particle Physics | M201 Physics Project (1.5 unit) OR MATH4901 Maths Project (1 unit) plus an *Option* |
| 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 | MATH2201 Algebra 3: Further Linear Algebra | *Option (Physics)* |
| MATH1101 Analysis 1 | MATH2101 Analysis 3: Complex Analysis | 3201 Electromagnetic Theory | *Option (Physics)* |
| MATH1401 Mathematical Methods 1 | MATH2401 Mathematical Methods 3 | MATH2301 Fluid Mechanics | *Option (Maths)* |
| MATH1402 Mathematical Methods 2 | *Option* | *Option* | *Option (Maths)* |
| MATH1203 Algebra for Joint Honours | *Option* | *Option* | *Option (either)* |

All courses are half units, unless otherwise stated.
It will be necessary for 1st year to attend the 5-6 lectures on Special Relativity in PHAS1246.

**Courses available for option selection**

| YEAR 2 | YEAR 3 | YEAR 4 |
|---|---|---|
| MATH7302 Analytical Dynamics | 2112 Astrophysical Processes: Nebulae to Stars | *See Separate table of Options on Page 24 for 1 cu of Physics to be taken at year 4 level.* |
| MATH7402 Mathematical Methods 4 | 2427 Environmental Physics | |
| | 3427 Energy & Climate | |
| MATH7501 Probability and Statistics | 3661 Physics of the Earth | |
| | 3459 Scientific Computing using Object oriented Languages | |
| | Mathematics Options | |

**MAIN COURSE OPTIONS FOR ALL 4TH YEAR MSci DEGREES**

(Read the notes below the table pertaining to possible choices of courses depending on degree programme.)
Masters level UCL undergraduate courses are labeled with an 'M' as the 5th character.
All courses are half units. They have a pass mark of 50%.

| **UCL**<br>**Mainly astronomy-related** | **UCL**<br>**Mainly physics-related** | **UCL**<br>**Mainly medical physics** |
|---|---|---|
| 3334 Interstellar Physics | M426 Advanced Quantum Theory (was 4426 or 4226) | MPHYM886 Optics in Medicine |
| M312 Planetary Atmospheres | M421 Atom and Photon Physics | MPHYM890 Medical Imaging with Ionising Radiation |
| M314 Solar Physics | M431 Molecular Physics | MPHYM891 Medical Imaging with Non-Ionising Radiation |
| M315 High Energy Astrophysics | M442 Particle Physics | MPHYM892 Treatment using Ionising Radiation |
| M336 Advanced Physical Cosmology | M427 Quantum Computation and Communication | MPHYM012 Physiological Monitoring |
| M319 Formation and Evolution of Stellar Systems | M465 Space Plasma and Magnetospheric Physics | MPHYM013 Medical Electronics |
| MATH3305 Mathematics for General Relativity | M472 Order and Excitations in Condensed Matter | **UCL**<br>**Mainly maths- related** |
| MATHM306 Cosmology | M800 Molecular Biophysics | MATHM302 Boundary layers |
| | 3661 Physics of the Earth | MATHM303 Gas Dynamics |
| | 3443 Lasers and Modern optics | |
| | 3447 Materials and Nanomaterials | |
| | 3226 Quantum Mechanics | |
| | 3424 Theory of Dynamical Systems | |
| | | |

*See Section 3 of this booklet, for a list of Intercollegiate courses available*.

***ALL STUDENTS MUST TAKE & PASS 3 or MORE MASTER LEVEL LECTURE COURSE TO BE GRANTED AN MSci DEGREE AND ALSO PASS THE MASTER LEVEL PROJECT.***

***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.

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

***Astrophysic***s students take at least 3 options from the astronomy-related courses.

# SECTION 3

# 4TH YEAR INTERCOLLEGIATE MSci COURSES

**FOURTH YEAR INTERCOLLEGIATE MSci COURSES**.

**N.B. For full details, content etc., please refer to the MSci Handbook on the web.**
http://personal.rhul.ac.uk/UHAP/027/MSci/Files/handbook.pdf
This list indicates some taught courses of the fourth year of the Intercollegiate MSci degree programmes available to UCL students. Any courses not listed here will need the approval of the Programme Tutors at UCL. Dr Furniss of Dr Zochowski.
Each course has a code number used by the Intercollegiate MSci board, shown at the left hand side. Colleges use local codes for the courses they teach. The *number* is usually the same as the MSci number, but some are different so beware! Local course codes are shown at the right hand side. All courses are a half course unit (in QMUL language, they are a full course unit). The list shows the course title and the term in which it is taught. Also indicated is the course teacher and the College supplying the course.

| MSci No. | Title | Term | Lecturer | College | Local No. |
|---|---|---|---|---|---|
| 4201 | Math methods for Theoretical Physics | 1 | Prof S. Sarkar | KCL | 7CCP4201 |
| 4205 | Lie Groups and Lie Algebras € | 1 | Dr. A. Recknagel | KCL+ | 7CCMMS01 |
| 4211 | Statistical Mechanics | 2 | Prof. B. Cowan | RHUL§ | PHS4211 |
| 4215 | Phase Transitions | 1 | | QMUL | |
| 4226 | Advanced Quantum Theory | 1 | Dr. D. Browne | UCL | PHASM426 |
| 4242 | Relativistic waves and Quantum Fields | 1 | Dr. R Russo | QMUL | PHY899 |
| 4245 | Advanced Quantum Field Theory | 2 | Dr. A Brandhuber | QMUL | |
| 4261 | Electromagnetic Theory | 1 | Prof. S. Thomas | QMUL | PHY966 |
| 4319 | Formation & Evolution of Stellar Systems | 1 | Dr. I. Ferreras | UCL | PHASM319 |
| 4421 | Atom and Photon Physics | 1 | Dr C Faria | UCL | PHASM421 |
| 4425 | Advanced Photonics | 2 | Prof. A. Zayats | KCL | 7CCP4126 |
| 4427 | Quantum Computation and Communication | 2 | Dr. A. Serafini | UCL | PHASM427 |
| 4431 | Molecular Physics | 2 | Prof A Shluger | UCL | PHASM431 |
| 4442 | Particle Physics | 1 | Dr. R. Nichol | UCL | PHASM442 |
| 4450 | Particle Accelerator Physics | 1 | Dr P. Karataev | RHUL | PH4450 |
| 4472 | Order & Excitations in Condensed Matter | 2 | Prof. D. McMorrow | UCL | PHASM472 |
| 4475 | Physics at the Nanoscale | 1 | Prof. V. Petrashov | RHUL | PH4475 |
| 4476 | Electronic Structure Methods | 2 | Dr Misquita | QMUL | |
| 4478 | Superfluids, Superconductors & Condensates. | 1 | Prof. J. Saunders | RHUL | PH4478 |
| 4501 | Standard Model Physics & beyond | 2 | Prof Mavromatos | KCL | 7CCP4500 |
| 4512 | Nuclear Magnetic Resonance | 2 | Dr. C. P. Lusher | RHUL* | PH4512 |
| 4515 | Computing and statistical data analysis | 1 | Prof. G. Cowan | RHUL | PH4515 |
| 4534 | String Theory and Branes € | 2 | Prof. P. West | KCL+ | 7CMMS34 |
| 4541 | Supersymmetry & Gauge Symmetry | 2 | Dr S Schafer-Nameki | KCL+ | 7CMMS41 |
| 4601 | Advanced Cosmology | 1$ | Dr. J.E.Lidsey | QMUL | |
| 4604 | General Relativity and Cosmology | 2 | Prof. N. Mavromatos | KCL | 7CCP4630 |
| 4605 | Astroparticle Cosmology | 2 | Prof. M. Sakellariadou | KCL | 7CCP4600 |
| 4630 | Planetary Atmospheres | 2 | Prof. A. Coates | UCL | PHASM312 |
| 4640 | Solar Physics | 2 | Dr. L van Driel & Dr. I. Phillips (change TBA) | UCL | PHASM314 |

| | | | | | |
|---|---|---|---|---|---|
| 4650 | Solar System | 1$ | Prof C Murray | QMUL‡ | MAS423 |
| 4660 | The Galaxy | 2 | Dr W Sutherland | QMUL | MAS430 |
| 4670 | Astrophysical Plasmas | 2$ | Prof. D. Burgess | QMUL | |
| 4680 | Space Plasma & Magnetospheric Physics | 2 | Dr A. Coates | UCL | PHASM465 |

Students will undertake project-related courses in accordance with practice at their own colleges.

‡ Taught by the Mathematics Department of QMUL.
$ These QMUL courses are taught in the evenings.
* Courses taught at RHUL in Egham. Also available over VideoCon at QMUL
+ Taught by the Mathematics Department of KCL
% Course taught over Video-Con network – sites at UCL, QMUL and RHUL.

Portico College Prefixes, KCL=10PI, QMUL=13PI, RHUL=47PI