# Programme Specification

# MPhys Particle Physics with a Research Year Abroad (2018-19)

This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided.

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|---|---|
| Awarding Institution | University of Southampton |
| Teaching Institution | University of Southampton |
| Mode of Study | Full-time |
| Duration in years | 4 |
| Accreditation details | Institute of Physics (IOP) |
| Final award | Master of Physics (MPhys) |
| Name of award | Particle Physics with a Research Year Abroad |
| Interim Exit awards | Bachelor of Science with Honours (BSc (Hons)) |
| | Certificate of Higher Education (CertHE) |
| | Diploma of Higher Education (DipHE) |
| FHEQ level of final award | Level 7 |
| UCAS code | N/A |
| Programme code | 4424 |
| QAA Subject Benchmark or other external reference | Physics, Astronomy And Astrophysics 2008 |
| Programme Lead | Stefano Moretti (stefano) |

## Programme Overview

**Brief outline of the programme**

Physics and astronomy are dynamic subjects which are continually being developed by new discoveries and innovations. In choosing to study physics at Southampton, you will benefit from being taught by research-active physicists who enjoy an outstanding international reputation in all research areas carried out within Physics & Astronomy. We assign a high priority to the continual development and improvement of our teaching methods and curriculum design in order to guarantee students a highly stimulating, as well as enjoyable and fruitful, learning experience.

Particle Physics is one of the strong research features of Southampton and you will collaborate closely with staff at the cutting-edge of the subject. The aim of this programme is to enable you to develop research skills by participating in one of three experiments at the "Large Hadron Collider" (LHC) at the Centre Europeenne Pour La Recherche Nucleaire (CERN): ATLAS, CMS or LHCb. Following the discovery of the Higgs boson, they are all now searching for the next level of fundamental physics, be it supersymmetry, string theory, extra-dimensions or something which we have not yet imagined. You will work within one of these three LHC collaborations helping our experimental partners from the Rutherford Appleton Laboratory (RAL) fulfil their responsibilities and experiencing a wide range of activities.

In the fourth year of this programme you will spend 30 weeks working in a research laboratory abroad. This will take place in the CERN in Geneva, near the Switzerland/France border, starting in September. During this period of time you will be under the immediate supervision of a local member of staff from RAL who will guide you in your work on a previously agreed programme of study. A member of staff from Southampton will visit you during your first 3/4 months to ensure satisfactory progress. At all stages, both the local Personal Tutor/Supervisor and Southampton Programme co-ordinator will proactively maintain communication with you. We recognise the potential diversity of our students both at home and internationally and thus this document has been written in accordance with the University's Diversity Policies and and current anti-discrimination legislation.

Please note: Exit awards only available under exceptional circumstances. Note that students must meet the standard criteria for progression to these awards before they can be granted. In the case of the CertHE and DipHE, core modules for the BSc Physics are treated as compulsory modules for the purpose of deciding whether progression to these awards has been accomplished.

*The BSc exit award for MPhys Particle Physics with a Research Year Abroad cannot be guaranteed if PHYS6009 Dissertation was not selected as an optional module in Semester 1 of Part 3.

Your contact hours will vary depending on your module/option choices. Full information about contact hours is provided in individual module profiles.

**Learning and teaching**

Core knowledge and understanding is acquired substantially via lectures, supported by tutor-led tutorials, laboratory practical classes, problem classes as well as guided independent study and research. Students are strongly encouraged to attend all the lectures for the courses on which you are registered and are required to attend all the supporting sessions.

**Assessment**

Assessment in the first, second and third year is a mixture of unseen written examinations, marked problem sheets and laboratory work. In your 3rd year in Southampton, as well as the standard MPhys third year core students will additionally take two final year, level-M units (PHYS6003 Advanced Quantum Physics, PHYS6011 Particle Physics) and are also required to take as core PHYS6017 Computer Techniques in Physics. In the fourth year students carry out a research project abroad. The aim of the year abroad is to enable first class students to take part in genuine research that will challenge their skills and knowledge in particle physics. Assessment for this year will be by two reports (one halfway through and one at the end), a viva and a seminar presentation.

## Special Features of the programme

N/A

**Please note:** As a research-led University, we undertake a continuous review of our programmes to ensure quality enhancement and to manage our resources. As a result, this programme may be revised during a student's period of registration; however, any revision will be balanced against the requirement that the student should receive the educational service expected. Please read our Disclaimer to see why, when and how changes may be made to a student's programme.

Programmes and major changes to programmes are approved through the University's programme validation process which is described in the University's Quality handbook.

## Educational Aims of the Programme

The aims of the programme are to:

1. introduce you to the main branches of physics;
2. help you to understand the principles of physics;
3. provide you with a solid foundation for a successful career as a physicist, and opportunities to develop skills transferable to a wide range of other careers, and to prepare you for further studies in physics leading to a graduate degree such as a Ph.D.;
4. offer you the opportunity to study some of the advanced concepts and techniques of contemporary physics;
5. enable you to develop skills in problem solving and critical and quantitative analysis in physics;
6. enable you to develop advanced knowledge and laboratory skills through undertaking laboratory work using a range of physical techniques.
7. provide you with some of the basic computing and numeracy skills necessary for further study and employment, including word-processing, data analysis and internet-based research;
8. enable you to develop computer programming skills and statistical techniques to support data analysis;
9. provide you with a friendly and supportive environment and enrich your learning experience through interaction with staff engaged in internationally respected research;
10. help you to develop a deeper insight into the theoretical framework underlying the principles of physics;
11. enable you to prepare and present seminars on advanced physics topics;
12. show how Mathematics has been used in unifying different physical phenomena and making precise predictions of physical quantities;
13. ensure that you become an increasingly independent learner and physicist as you progress through the programme.

## Programme Learning Outcomes

### Knowledge and Understanding

On successful completion of this programme you will have knowledge and understanding of:

A1. Mathematics required for the description of the physical world;

A2. The breakdown of classical (19th century) physics and the revolution in physics at the beginning of the 20th century;

A3. Special relativity and its application in nuclear physics and high-energy particle scattering;

A4. The quantitative description of oscillating systems and wave-motion;

A5. Newtonian mechanics and its application to physical systems;

A6. Quantum theory, both from qualitative and quantitative (quantum mechanics) viewpoints;

A7. Application of quantum theory to describe the structure of atoms and nuclei;

A8. The laws of thermodynamics and their consequences for the behaviour of physical systems;

A9. Statistical mechanics as a basis for the microscopic description of thermodynamic systems;

A10. Electricity, magnetism and their unification through the laws of electromagnetism;

A11. A wide range of physics experimental techniques;

A12. Electromagnetic waves and optics;

A13. Quantum theory applied to relativistic systems;

A14. Advanced classical and quantum mechanics and electromagnetism;

A15. Specific topics selected for a dissertation and final year project.

A16. Properties of elementary particles and their interactions;

A17. The use of accelerators to produce elementary particle interactions;

A18. The performance of detector study the yield of elementary particle interactions.

**Teaching and Learning Methods**

The topics listed in skills A1-A18 are taught mainly via lectures, directed reading and laboratory work as part of the core modules associated with this programme. Learning is reinforced via tutorials (in Part I), project work (particularly in the final research year), coursework and problems classes.

**Assessment Methods**

The topics listed in skills A1-A18 are assessed via a range of assessment methods. Assessment in the first and second year is a mixture of unseen written examinations, marked problem-based coursework and laboratory work. For the MPhys programmes, assessment in the third year is mainly by examination, although laboratory- based, computer-based and dissertation modules will use different assessment methods, as appropriate. In the fourth year of this programme, a year-long research project is assessed using continuous assessment, written reports and an oral examination.

## Subject Specific Intellectual and Research Skills

On successful completion of this programme you will be able to:

B1. Apply knowledge of physics to the solution of theoretical and practical physical problems;

B2. Apply mathematical techniques in algebra, vectors, calculus and differential equations to the solution of physical problems;

B3. Program and use computers to assist in the solution of physical problems;

B4. Carry out a literature search for relevant material for the preparation of dissertations;

B5. Assimilate new material independently;

B6. Prepare and deliver seminars on specific subjects;

B7. Interpret data using statistical techniques and make decisions taking into account experimental errors.

B8. Participate in teams of experimental Particle Physicists

**Teaching and Learning Methods**

Problem solving (items B1-B3) is at the heart of physics, and so it is emphasized throughout the learning and teaching experience, in lectures, coursework and problem classes. Mathematics skills (item B2) are developed via core maths modules in Part I and the use the techniques learned there in physics core modules in Parts I-III. Computer skills (item B3) are developed via a core Part I computing module (PHYS1201), and part of the core laboratory module (PHYS2022) in Part II. They can also be developed via optional modules (e,g, PHYS6017) and are often developed further and exploited in final year projects. Data analysis, interpretation and associated decision making (item B7) are developed primarily via core laboratory modules in Parts I and II, but usually also developed further in the final year project, which is also core. Skills B5-B8 will all be acquired during a year of research embedded in research groups, supervised by experienced researchers

**Assessment Methods**

Problem solving and mathematical skills (items B1-B2) are assessed mostly via written examinations, but also via assessed coursework, especially in Parts I and II of the programme. Problem-solving (B1), in particular, is also a key aspect of the final year project, which is assessed via supervisor's judgment of research work, a written report and an oral examination. Computing modules in Part I and Part II are assessed via practical exercises. Data interpretation and related decision making (B4-B8) are assessed via practical work, vivas and presentations in the Part 1-3 laboratory modules and in the final year research project.

## Transferable and Generic Skills

On successful completion of this programme you will be able to:

C1. Communicate physical ideas in written form;

C2. Recognise the value of numeracy in the precise statement of ideas;

C3. Prepare and give an oral presentation using visual aids;

C4. Prepare a scientific report using appropriate computer tools for document preparation, data analysis and graphical display;

C5. Use information from a variety of sources including scientific journals, books and the internet;

C6. Manage a project with due attention to time and resource management;

C7. Work successfully as a team member;

**Teaching and Learning Methods**

Skill C1 is covered mainly via self-study (with help and feedback available) in the Physics Skills/Physics from Evidence lab modules (via write-ups), in the final year project (which is partly assessed via a written report), and (for the MPhys) the dissertation module. Skill C2 is embedded throughout the curriculum, with practical applications in experimental and project work. Skill C3 is covered the Part II Physics from Evidence laboratory module, which includes a “conference” component, during which students give an assessed presentation on your laboratory work at a mock scientific conference. It is also covered (for MPhys students) in the dissertation module, which includes a presentation associated with the teamwork

component. Skill C4 is covered in laboratory and project work, as well as the dissertation module (for MPhys students). Skill C5 is covered by the final year project, as well as the dissertation module (for MPhys students). Skill C6 is developed especially during the final year project, but also during the dissertation module (for Mphys students). Skill C7 is developed during all lab modules (which typically are done in pairs), during the final year project (again, this is usually done in pairs), and particularly during the dissertation module (which includes a team work component).

**Assessment Methods**

Skill C1 is assessed with written reports on experimental work in laboratory modules, via the written report required for the final year project, and (for the MPhys) via the written report required for the dissertation module. Skill C2 is assessed in a variety of ways throughout the programme – it is an ingredient in everything from formal exams, to oral examinations, to written reports and presentations. Skill C3 is assessed via a presentation students give during a mock scientific conference which is part of the Part II Physics from Evidence laboratory module. Skill C4 is assessed in the marking of all written coursework and reports, such as laboratory and project work, and also the report for the dissertation module (for MPhys students). Skill C5 is assessed as an explicit component in the mark scheme for the the final year project report, and also in the report for the dissertation module (for MPhys students). Skill C6 is is assessed primarily via the supervisor's mark on the final year project performance, but of course also via the report on the project (and, for MPhys students) the dissertation module. For MPhys students, skill C7 is assessed explicitly via the team work component of the final year project. The mark for this is assigned by the module coordinator, but takes into account team members assessment of each other's contribution. For the final year project, team work can also be a factor in a supervisor's assessment for the final year project.

## Subject Specific Practical Skills

On successful completion of this programme you will be able to:

D1. Use standard laboratory and observatory apparatus for physical measurements;

D2. Design and set up advanced experiments using apparatus similar to that found in research laboratories;

D3. Carry out a critical analysis of experimental data;

D4. Use computers for the acquisition, storage, and analysis of data, and problem solving

**Assessment Methods**

Skill D1 is developed and assessed primarily via the core laboratory modules in Parts I and II. D2 and D3 are developed during laboratory modules, and then further in the final year. The fundamentals for skill D4 are introduced in a core Part I module (PHYS1201) and assessed via coursework. Skill D4 is developed and assessed during the laboratory modules, especially the Part II Physics from Evidence module, which includes a computing component.

## Programme Structure

The programme structure table is below:

Information about pre and co-requisites is included in individual module profiles.

**Part I**

The structure of your degree programme allows you to exercise choice in a number of modules in each year of study. You can exercise this choice in a number of ways.

· You can use these modules to deepen your knowledge of your main subject.
· You can combine additional modules from your main subject with modules from other disciplines or choose from a selection of interdisciplinary modules.
· Courses in French (worth 15 ECTS/30 CATS) are available at all levels. Although not essential your experience at CERN would be enhanced by taking this as your option.

Programme details

This structure assumes entry via the MPhys programme, and optional modules in Parts I and II are the same as those available to MPhys students. Entry via other programmes, and with other optional modules, is possible.

The information in this programme specification is accurate at the time of writing, but may change in minor ways from year to year due to staff availability or other factors. Some of these modules are subject to pre- requisites and exclusions that, for brevity, are not given here; this information is available in the module specifications on the Physics & Astronomy Undergraduate Teaching website.

The module requirements for each programme are shown for each Part below; modules are either core (must be taken and passed), compulsory (must be taken) or optional (may be taken).

It should be noted that it may not be possible to run some optional modules if the number of students registered on the module is very small. It should also be noted that optional module choice can be restricted by the University Timetable, which varies from year to year: some optional modules may clash with other optional or compulsory modules. Please be aware that many modules are shared between different cohorts; the class size depends on cohort size, which varies from year to year.

**Part I Core**

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| PHYS1022 | Electricity and Magnetism | 5 | Core |
| PHYS1013 | Energy and Matter | 5 | Core |
| MATH1006 | Mathematical Methods for Physical Scientists 1a | 7.5 | Core |

| | | | |
|---|---|---|---|
| MATH1007 | Mathematical Methods For Physical Scientists 1b | 7.5 | Core |
| PHYS1015 | Motion and Relativity | 5 | Core |
| PHYS1201 | Physics Skills - Programming and Data Analysis | 7.5 | Core |
| PHYS1017 | Physics Skills 1 | 5 | Core |
| PHYS1019 | Physics Skills 2 | 5 | Core |
| PHYS1011 | Waves, Light and Quanta | 5 | Core |

**Part I Optional**

You will be able to select 7.5 ECTS/15 CATS of optional modules in semester 1. These can include broadening options (LANGXXXX, UOSMXXXX, etc.) that may be chosen from the list of modules provided in the programme catalogue (online option choice system).

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| PHYS1005 | Introduction to Astronomy and Space Science | 7.5 | Optional |
| PHYS1004 | Introduction to Photonics | 7.5 | Optional |
| MATH1048 | Linear Algebra I | 7.5 | Optional |

**Part II**

**Part II Core**

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| PHYS2006 | Classical Mechanics | 7.5 | Core |
| PHYS2001 | Electromagnetism | 7.5 | Core |
| PHYS2022 | Physics from Evidence I | 7.5 | Core |
| PHYS2003 | Quantum Physics | 7.5 | Core |

| | | | |
|---|---|---|---|
| PHYS2024 | Quantum Physics of Matter | 7.5 | Core |
| PHYS2023 | Wave Physics | 7.5 | Core |

### Part II Optional

You will be able to select 7.5 ECTS/15 CATS of optional modules per semester. These can include broadening options (LANGXXXX, UOSMXXXX, etc.) that may be chosen from the list of modules provided in the programme catalogue (online option choice system).

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| PHYS3019 | Communicating and Teaching and The Undergraduate Ambassadors Scheme | 7.5 | Optional |
| PHYS2013 | Galaxies | 7.5 | Optional |
| PHYS2015 | Introduction to Energy in The Environment | 7.5 | Optional |
| PHYS2009 | Practical Photonics | 7.5 | Optional |

## Part III

### Part III Compulsory

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| PHYS6017 | Computer Techniques in Physics | 7.5 | Compulsory |

### Part III Core

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| PHYS6003 | Advanced Quantum Physics | 7.5 | Core |
| PHYS3008 | Atomic Physics | 7.5 | Core |
| PHYS3004 | Crystalline Solids | 7.5 | Core |
| PHYS3002 | Nuclei and Particles | 7.5 | Core |

| | | | |
|---|---|---|---|
| PHYS6011 | Particle Physics | 7.5 | Core |
| PHYS3007 | Theories of Matter, Space and Time | 7.5 | Core |

**Part III Optional**

You will be able to select 7.5 ECTS/15 CATS of optional modules in semester 1. These can include broadening options (LANGXXXX, UOSMXXXX, etc.) that may be chosen from the list of modules provided in the programme catalogue (online option choice system).

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| PHYS6012 | Coherent Light, Coherent Matter | 7.5 | Optional |
| PHYS6009 | Dissertation | 7.5 | Optional |
| PHYS2013 | Galaxies | 7.5 | Optional |
| PHYS3003 | Light and Matter | 7.5 | Optional |
| PHYS2024 | Quantum Physics of Matter | 7.5 | Optional |

**Part IV**

**Part IV Core**

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| PHYS6016 | Particle Physics Research Project | 60 | Core |

## Progression Requirements

The programme will follow the University's regulations for ***Progression, Determination and Classification of Results: Undergraduate and Integrated Masters Programmes*** or the University's regulations for ***Progression, Determination and Classification of Results: Standalone Masters Programmes*** as set out in the General Academic Regulations in the University Calendar: http://www.calendar.soton.ac.uk/sectionIV/sectIV-index.html

## Support for student learning

There are facilities and services to support your learning some of which are accessible to students across the

University and some of which will be geared more particularly to students in your particular Faculty or discipline area.

The University provides:

- library resources, including e-books, on-line journals and databases, which are comprehensive and up-to-date; together with assistance from Library staff to enable you to make the best use of these resources
- high speed access to online electronic learning resources on the Internet from dedicated PC Workstations onsite and from your own devices; laptops, smartphones and tablet PCs via the Eduroam wireless network. There is a wide range of application software available from the Student Public Workstations.
- computer accounts which will connect you to a number of learning technologies for example, the Blackboard virtual learning environment (which facilitates online learning and access to specific learning resources)
- standard ICT tools such as Email, secure filestore and calendars.
- access to key information through the MySouthampton Student Mobile Portal which delivers timetables, Module information, Locations, Tutor details, Library account, bus timetables etc. while you are on the move.
- IT support through a comprehensive website, telephone and online ticketed support and a dedicated helpdesk in the Hartley Library.
- Enabling Services offering support services and resources via a triage model to access crisis management, mental health support and counselling. Support includes daily Drop In at Highfield campus at 13.00 – 15.00 (Monday, Wednesday and Friday out of term-time) or via on-line chat on weekdays from 14.00 – 16.00. Arrangements can also be made for meetings via Skype.
- assessment and support (including specialist IT support) facilities if you have a disability, long term health problem or Specific Learning Difficulty (e.g. dyslexia).
- the Student Services Centre (SSC) to assist you with a range of general enquiries including financial matters, accommodation, exams, graduation, student visas, ID cards
- Career and Employability services, advising on job search, applications, interviews, paid work, volunteering and internship opportunities and getting the most out of your extra-curricular activities alongside your degree programme when writing your CV
- Other support that includes health services (GPs), chaplaincy (for all faiths) and 'out of hours' support for students in Halls and in the local community, (18.00-08.00)
- A Centre for Language Study, providing assistance in the development of English language and study skills for non-native speakers.

The Students' Union provides

- an academic student representation system, consisting of Course Representatives, Academic Presidents, Faculty Officers and the Vice-President Education; SUSU provides training and support for all these representatives, whose role is to represent students' views to the University.
- opportunities for extracurricular activities and volunteering
- an Advice Centre offering free and confidential advice including support if you need to make an academic appeal
- Support for student peer-to-peer groups, such as Nightline.

Associated with your programme you will be able to access:

· All students have a personal tutor, with whom they meet regularly, particularly during the first year where small group tutorials are used to discuss the core physics courses and associated coursework/problem sheets. Tutors offer help on both academic matters, such as choice of option courses, and on pastoral matters.

· The Year Directors of Studies, the Director of Programmes, as well as the Senior Tutor are available to give help and advice as required.

· One of the primary functions of the Faculty Office is student support and guidance. The Faculty Office is able to provide information on wide range of topics, including programme regulations, special consideration procedures, appeals, and much more.

· The student physics society Physoc organizes a “parenting” scheme in which all new arrivals are looked after by senior physics students. Physoc also runs an academic mentoring scheme that aims to provide academic tutoring, help and advice for students by students.

· In the first and second year, each core module has an associated compulsory problems class where demonstrator provide individual help on the course material and/or coursework;

· Students normally work in pairs on final year projects, which are supervised by a member of academic staff who is likely to be an internationally respected expert.

· Most modules provide printed lecture notes that are either distributed or are available online.

· Key transferable skills are embedded throughout our courses, particularly those which contain coursework or laboratory work.

· Provision is made for any student who specifically wishes to consult a female member of staff.

· We are proud of the friendly atmosphere in Physics & Astronomy. Members of staff are happy to be approached for help. The Faculty Office also provides support for students throughout their programmes.

## Methods for evaluating the quality of teaching and learning

You will have the opportunity to have your say on the quality of the programme in the following ways:

· Completing student evaluation questionnaires for each module of the programme

· Acting as a student representative on various committees, e.g. Staff: Student Liaison Committees, Faculty Programmes Committee OR providing comments to your student representative to feed back on your behalf.

· Serving as a student representative on Faculty Scrutiny Groups for programme validation

· Taking part in programme validation meetings by joining a panel of students to meet with the Faculty Scrutiny Group

The ways in which the quality of your programme is checked, both inside and outside the University, are:

1. Annual module and programme reports which are monitored by the Faculty

2. Programme validation, normally every five years.

3. External examiners, who produce an annual report

4. Regular inspections and accreditation by the Institute of Physics

5. A national Research Excellence Framework (our research activity contributes directly to the quality of your learning experience)

6. Higher Education Review by the Quality Assurance Agency

Further details on the University's quality assurance processes are given in the *Quality Handbook.*

## Career Opportunities

We believe in helping our students gain the necessary experience for a future career, along with the skills to identify opportunities and make the most of them. At Southampton, you will have the opportunity to broaden your options by meeting employers, getting involved in volunteering activities, work placements and much more.

We work hard to help our students enter exciting careers. Our Academic Careers Team, supported by our student society (PHYSOC), put on over 40 hours a year of careers advice ranging from helping you write your CV, to advice on how to set up a small business, to mock interviews supported by real companies. We work with our students to find them placements and internships, which will help them to gain valuable work experience, preparing them for employment when they graduate. In 2012, 86% of our students began a career within six months of graduating.

We are part of South East Physics Network (SEPNet,) who we work with to organise eight-week paid internships for our students during the summer vacation. In previous years, students have been placed with a wide range of organisations, including The National Physical Laboratory, BMW, The Met Office, SELEX Galileo, QinetiQ, the Culham Centre for Fusion Energy. As well as offering employment opportunities, these companies offer advice to our students about how to become more competitive in the work place.

SEPNet has a dedicated Careers Adviser who our students can liaise with. We work with SEPNet to offer our students the chance to attend 'meet the employer' days as well as careers talks with speakers from industry.

## External Examiner(s) for the programme

Name: Professor Haley Gomez - University of Cardiff

Name: Professor Simon Cornish - Durham University

Students must not contact External Examiner(s) directly, and external examiners have been advised to refer any such communications back to the University. Students should raise any general queries about the assessment and examination process for the programme with their Course Representative, for consideration through Staff: Student Liaison Committee in the first instance, and Student representatives on Staff: Student Liaison Committees will have the opportunity to consider external examiners' reports as part of the University's quality assurance process.

External examiners do not have a direct role in determining results for individual students, and students wishing to discuss their own performance in assessment should contact their Personal Academic Tutor in the first instance.

**Please note:** This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided. More detailed information can be found in the programme handbook.

# Appendix 1:

Students are responsible for meeting the cost of essential textbooks, and of producing such essays, assignments, laboratory reports and dissertations as are required to fulfil the academic requirements for each programme of study. In addition to this, students registered for this programme also have to pay for:

**Additional Costs**

| Type | Details |
|---|---|
| Stationery | You will be expected to provide your own day-to-day stationary items, e.g. pens, pencils, notebooks, etc). Any specialist stationery items will be specified under the Additional Costs tab of the relevant module profile. |
| Textbooks | Where a module specifies core texts these should generally be available on the reserve list in the library. However due to demand, students may prefer to buy their own copies. These can be purchased from any source.<br><br>Some modules suggest reading texts as optional background reading. The library may hold copies of such texts, or alternatively you may wish to purchase your own copies. Although not essential reading, you may benefit from the additional reading materials for the module. |
| Placements (including Study Abroad Programmes) | PHYS6016: For AY 2016/17 onwards: The stay at CERN will typically be for 8 months. Payable home accommodation will be provided by RAL staff, and tuition fees will be charged at 15% of the standard level. A £500 Southampton Opportunity scholarship will be awarded to help cover for the difference in living costs between Southampton and Geneva and the purchase of at least one return flight. |
| Approved Calculators | Candidates may use calculators in the examination room only as specified by the University and as permitted by the rubric of individual examination papers. The University approved models are Casio FX-570 and Casio FX-85GT Plus. These may be purchased from any source and no longer need to carry the University logo. |
| Printing and Photocopying Costs | In the majority of cases, coursework such as essays; projects; dissertations is likely to be submitted on line. However, there are some items where it is not possible to submit on line and students will be asked to provide a printed copy. |

In some cases you'll be able to choose modules (which may have different costs associated with that module) which will change the overall cost of a programme to you. Details of such costs will be listed in the Module Profile. Please also ensure you read the section on additional costs in the University's Fees, Charges and Expenses Regulations in the University Calendar available at www.calendar.soton.ac.uk.