

## Royal Holloway, University of London

### Course specification for an undergraduate award

### BSc Mathematics and Physics (GF13)

#### Section 1 – Introduction to your course

This course specification is a formal document, which provides a summary of the main features of your course and the learning outcomes that you might reasonably be expected to achieve and demonstrate if you take full advantage of the learning opportunities that are provided. Further information is contained in the College prospectus, and in various handbooks, all of which you will be able to access online. Alternatively, further information on the College's academic regulations and policies can be found [here](#). Further information on the College's Admissions Policy can be found [here](#).

Your degree course in BSc Mathematics and Physics is delivered in three stages, each of which comprises one year of full-time study during which you must follow modules to the value of 120 credits.

In stage one the mandatory modules in the Department of Mathematics seek to provide a broadly based introduction to mathematics, which will develop manipulative skills, understanding of the key concepts and the ability to construct logical arguments. In stage two, you take modules, which continue your study of abstract pure mathematics and its applications. In stage three, you choose modules to the value of 120 credits and you are advised on appropriate combinations and pathways depending on your interests, stage one and two options, and possible future career paths. You may choose to undertake an extended project.

For joint and combined honours courses, please refer to the course specification for your secondary department's corresponding single honours course for further information on educational aims, and learning outcomes.

While Royal Holloway keeps all the information made available under review, courses and the availability of individual modules, especially optional modules are necessarily subject to change at any time, and you are therefore advised to seek confirmation of any factors which might affect your decision to follow a specific course. In turn, Royal Holloway will inform you as soon as is practicable of any significant changes which might affect your studies.

The following is brief description for some of the most important terminology for understanding the content of this document:

*Degree course* – May also be referred to as 'degree programme' or simply 'programme', these terms refer to the qualification you will be awarded upon successful completion of your studies.

*Module* – May also be referred to as 'course', this refers to the individual units you will study each year to complete your degree course. Undergraduate degrees at Royal Holloway comprise a combination of modules in multiples of 15 credits to the value of 120 credits per year. On some degree courses a certain number of optional modules must be passed for a particular degree title.

| Section 2 – Course details  |  |  |  |
|---|--|--|--|
| Date of specification update  | April 2020   | Location of study  | Egham Campus   |
| Course award and title  | BSc Mathematics and Physics  | Level of study   | Undergraduate  |
| Course code   | 1280   | UCAS code  | GF13   |
| Year of entry   | 2020/21  |  |  |
| Awarding body   | Royal Holloway, University of London   |  |  |
| Department or school  | Mathematics  | Other departments or schools involved in teaching the course | Physics  |
| Mode(s) of attendance   | Full-time  | Duration of the course                                       | Three years  |
| Accrediting Professional, Statutory or Regulatory Body requirement(s) | Institute of Physics (IOP) - successful completion of the BSc Mathematics and Physics will enable students to partially meet the educational requirement for becoming a Chartered Physicist. |  |  |
| Link to Coursefinder for further information:                         | <a href="https://www.royalholloway.ac.uk/studying-here/">https://www.royalholloway.ac.uk/studying-here/</a>  | For queries on admissions:                                   | <a href="mailto:study@royalholloway.ac.uk">study@royalholloway.ac.uk</a> . |

| Section 3 – Degree course structure   |             |  |                |                  |                 |                        |              |         |            |                           |
|---|-------------|--|----------------|------------------|-----------------|------------------------|--------------|---------|------------|---------------------------|
| 3.1 Mandatory module information  |             |  |                |                  |                 |                        |              |         |            |                           |
| The following table summarises the mandatory modules which students must take in each year of study |             |  |                |                  |                 |                        |              |         |            |                           |
| Year  | Module code | Module title   | Contact hours* | Self-study hours | Written exams** | Practical assessment** | Coursework** | Credits | FHEQ level | Module status (see below) |
| 1   | MT1710      | Calculus I   | 42             | 108              | 85%             | 0                      | 15%          | 15      | 4          | MC                        |
| 1   | MT1720      | Calculus II  | 39             | 111              | 85%             | 0                      | 15%          | 15      | 4          | MC                        |
| 1   | MT1810      | Introduction to Pure Mathematics                       | 48             | 102              | 85%             | 0                      | 15%          | 15      | 4          | MC                        |
| 1   | MT1820      | Linear Algebra I                                       | 39             | 111              | 85%             | 0                      | 15%          | 15      | 4          | MC                        |
| 1   | PH1140      | Physics: Scientific Skills 1                           | 71             | 79               | 0               | 6%                     | 94%          | 15      | 4          | MC                        |
| 1   | PH1320      | Physics: Classical Mechanics                           | 40             | 110              | 80%             | 0                      | 20%          | 15      | 4          | MC                        |
| 1   | PH1620      | Physics: Classical Matter                              | 40             | 110              | 80%             | 0                      | 20%          | 15      | 4          | MC                        |
| 1   | PH1920      | Physics: Physics of the Universe                       | 40             | 110              | 80%             | 0                      | 20%          | 15      | 4          | MC                        |
| 2   | MT2220      | Mathematics: Vector Calculus                           | 30             | 120              | 85%             | 0                      | 15%          | 15      | 5          | MC                        |
| 2   | MT2720      | Mathematics: Differential Equations & Fourier Analysis | 30             | 120              | 85%             | 0                      | 15%          | 15      | 5          | MC                        |
| 2   | PH2150      | Physics: Scientific Computing Skills                   | 82             | 68               | 0               | 0                      | 100%         | 15      | 5          | MC                        |
| 2   | PH2210      | Physics: Quantum Mechanics                             | 38             | 112              | 90%             | 0                      | 10%          | 15      | 5          | MC                        |
| 2   | PH2610      | Physics: Classical and Statistical Thermodynamics      | 38             | 112              | 90%             | 0                      | 10%          | 15      | 5          | MC                        |

|   |        |   |    |     |     |     |     |    |   |    |
|---|--------|---|----|-----|-----|-----|-----|----|---|----|
| 2 | PH2710 | Physics: The Solid State                        | 38 | 112 | 90% | 0   | 10% | 15 | 5 | MC |
| 3 | PH2310 | Physics: Optics                                 | 38 | 112 | 90% | 0   | 10% | 15 | 5 | MC |
| 3 | PH3010 | Physics: Advanced Skills                        | 56 | 94  | 0   | 15% | 85% | 15 | 6 | MC |
| 3 | PH3110 | Physics:<br>Experimental/Theoretical<br>Project | 93 | 57  | 0   | 15% | 85% | 15 | 6 | MC |
| 3 | PH2420 | Physics: Electromagnetism                       | 38 | 112 | 90% | 0   | 10% | 15 | 6 | MC |

This table sets out the most important information for the mandatory modules on your degree course. These modules are central to achieving your learning outcomes, so they are compulsory, and all students on your degree course will be required to take them. You will be automatically registered for these modules each year. Mandatory modules fall into two categories; 'condonable' or 'non-condonable'.

In the case of mandatory 'non-condonable' (MNC) modules, you must pass the module before you can proceed to the next year of your course, or to successfully graduate with a particular degree title. In the case of mandatory 'condonable' (MC) modules, these must be taken but you can still progress or graduate even if you do not pass them. Please note that although Royal Holloway will keep changes to a minimum, changes to your degree course may be made where reasonable and necessary due to unexpected events. For example; where requirements of relevant Professional, Statutory or Regulatory Bodies have changed and course requirements must change accordingly, or where changes are deemed necessary on the basis of student feedback and/or the advice of external advisors, to enhance academic provision.

\*Contact hours come in various different forms, and may take the form of time spent with a member of staff in a lecture or seminar with other students. Contact hours may also be laboratory or, studio-based sessions, project supervision with a member of staff, or discussion through a virtual learning environment (VLE). These contact hours may be with a lecturer or teaching assistant, but they may also be with a technician, or specialist support staff.

\*\*The way in which each module on your degree course is assessed will also vary, however, the assessments listed above are all 'summative', which means you will receive a mark for it which will count towards your overall mark for the module, and potentially your degree classification, depending on your year of study. On successful completion of the module you will gain the credits listed. 'Coursework' might typically include a written assignment, like an essay. Coursework might also include a report, dissertation or portfolio. 'Practical assessments' might include an oral assessment or presentation, or a demonstration of practical skills required for the particular module.

### 3.2 Optional modules

In addition to mandatory modules, there will be a number of optional modules available during the course of your degree. The following table lists a selection of optional modules that are likely to be available. However, not all may be available every year. Although Royal Holloway will keep changes to a minimum, new options may be offered or existing ones may be

withdrawn. For example; where reasonable and necessary due to unexpected events, where requirements of relevant Professional, Statutory or Regulatory Bodies (PSRBs) have changed and course requirements must change accordingly, or where changes are deemed necessary on the basis of student feedback and/or the advice of External Advisors, to enhance academic provision. There may be additional requirements around option selection, so it is important that this specification is read alongside your department's Student Handbook, which you can access via their [webpage](#).

| Year 1 | Year 2   | Year 3  |
|--------|--|---|
| None   | Mathematics: MT2300 Statistical Methods II             | Mathematics: MT3090 Mathematics In The Classroom                  |
|        | Mathematics: MT2320 Probability Theory                 | Mathematics: MT3110 Number Theory                                 |
|        | Mathematics: MT2630 Graphs and Optimisation            | Mathematics: MT3120 Number Theory II                              |
|        | Mathematics: MT2830 Rings Theory                       | Mathematics: MT3130 Complexity Theory                             |
|        | Mathematics: MT2860 Groups and Group Actions           | Mathematics: MT3140 Principles of Algorithm Design                |
|        | Mathematics: MT2880 Further Linear Algebra and Modules | Mathematics: MT3280 Non-Linear Dynamical Systems: Routes to Chaos |

### 3.3 Optional module requirements

At stage two, you must take options to the value of 30 credits from stage two modules offered by the Department of Mathematics.

At stage three, you must choose optional modules as appropriate from the list of stage three modules offered by the Departments to ensure you take 60 credits of modules in Maths and 60 credits of modules in Physics. Some modules in stage three may be counted as a Maths OR a Physics module, and you should seek advice from your personal tutor when choosing modules to ensure you have the correct balance between the two subjects.

## Section 4 - Progressing through each year of your degree course

For further information on the progression and award requirements for your degree, please refer to Royal Holloway's [Academic Regulations](#). As part of your degree course you may also be required to complete a module to develop your academic writing skills. This module does not carry credit but passing it is a requirement to progress to the next year of study.

## Section 5 – Educational aims of the course

The aims of this course are:

- to provide students with technical manipulative skills, the ability to read and write in the compressed language of mathematics, and the ability to distil a problem into a mathematical description of its essential detail;
- to ensure that students gain an appreciation of, and interest in, the logical structure of mathematics, and its use as an analytical and predictive tool in applications;
- to offer a wide range of optional modules to suit students' interests and strengths;
- to provide access to personal, academic and pastoral support;
- to enable students, on graduation, to compete effectively in employment or postgraduate study.

| Section 6 - Course learning outcomes   |  |
|--|--|
| <p>In general terms, the courses provide opportunities for students to develop and demonstrate the following learning outcomes. (<i>Categories – Knowledge and understanding (K), Skills and other attributes (S), and Transferable skills (*)</i>)</p>  |  |
| <ol style="list-style-type: none"> <li>1. Of mathematical methods (<b>K</b>);</li> <li>2. Of mathematical concepts such as number and function (<b>K</b>);</li> <li>3. Of abstract structures such as groups, matrices, and fields (<b>K</b>);</li> <li>4. Of some results from a range of major areas of mathematics, statistics or operational research (<b>K</b>);</li> <li>5. Of at least one major area of applications in which the mathematics is used in a serious manner and is essential for proper understanding (<b>K</b>);</li> <li>6. A high level of numeracy (<b>S</b>);</li> <li>7. Ability to manipulate and analyze complex mathematical expressions accurately (<b>S</b>);</li> <li>8. Ability to understand the role of logical mathematical argument and deductive reasoning, including formal proof (<b>S</b>);</li> <li>9. Familiarity with computer methods in mathematics and statistics (<b>S</b>);</li> <li>10. Ability to formulate problems in mathematical or statistical form using appropriate notation (<b>S</b>);</li> <li>11. The ability to solve equations or inequalities arising from a problem analytically or numerically, and to interpret the results (<b>S</b>);</li> </ol> | <ol style="list-style-type: none"> <li>12. Accurate analysis of a situation, the factors involved and possible approaches to solution. This is embedded in a general ethos of numeracy and of analytical approaches to problem solving (<b>S</b>);</li> <li>13. Ability to take theoretical knowledge gained in one area and apply it elsewhere (<b>S</b>);</li> <li>14. Ability to make a sequence of logical steps, and reflect on the result (<b>S</b>);</li> <li>15. Ability to communicate mathematical results clearly, to both mathematicians and lay persons (<b>S</b>);</li> <li>16. Spatial awareness in two and three dimensions (<b>S</b>);</li> <li>17. Good general skills of time-management and organization (<b>S*</b>);</li> <li>18. To learn independently, using a variety of media including books, learned journals, the internet etc (<b>S*</b>);</li> <li>19. To work independently with persistence and patience, pursuing the solution of problems to their conclusion (<b>S*</b>);</li> <li>20. Develop IT skills, including word-processing and use of the internet (<b>S*</b>);</li> <li>21. Personal motivation and the planning of a career path (<b>S*</b>);</li> <li>22. Good written and oral communication skills, which enable them to write coherently and turn a rough draft into a convincing argument and contribute to discussions (<b>S*</b>);</li> <li>23. Ability to work together with others as a team (<b>S*</b>).</li> </ol> |

| Section 7 - Teaching, learning and assessment  |
|--|
| <p>Teaching and learning is mostly by means of lectures, small group tutorials, problem-solving workshop sessions, written and oral feedback on coursework, practical sessions in statistics and computational mathematics, guided independent study and oral presentations. You are in addition encouraged to read around the subject, and at the end of the first and second stages you write essays or projects on topics of your own choice. Assessment is typically by formal examinations and in certain modules in-term tests, projects, coursework essays and oral presentations. Full details of the assessment methods for individual modules may be obtained from the <a href="#">Department</a>.</p> |

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| <b>Section 8 – Additional costs</b>   |
| £55 (Physics)   |
| These estimated costs relate to studying this particular degree course at Royal Holloway. General costs such as accommodation, food, books and other learning materials and printing etc., have not been included, but further information is available on our website. |

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|--|---|
| <b>Section 9 – Indicators of quality and standards</b>   |   |
| <b>QAA Framework for Higher Education Qualifications (FHEQ) Level</b>  | 4-6   |
| Your course is designed in accordance with the FHEQ to ensure your qualification is awarded on the basis of nationally established standards of achievement, for both outcomes and attainment. The qualification descriptors within the FHEQ set out the generic outcomes and attributes expected for the award of individual qualifications. The qualification descriptors contained in the FHEQ exemplify the outcomes and attributes expected of learning that results in the award of higher education qualifications. These outcomes represent the integration of various learning experiences resulting from designated and coherent courses of study. |   |
| <b>QAA Subject benchmark statement(s)</b>  | <a href="http://www.qaa.ac.uk/quality-code/subject-benchmark-statements">http://www.qaa.ac.uk/quality-code/subject-benchmark-statements</a> |
| Subject benchmark statements provide a means for the academic community to describe the nature and characteristics of courses in a specific subject or subject area. They also represent general expectations about standards for the award of qualifications at a given level in terms of the attributes and capabilities that those possessing qualifications should have demonstrated.  |   |



### Section 10 – Further information

This specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate when taking full advantage of the learning opportunities that are available. More detailed information on modules, including teaching and learning methods, and methods of assessment, can be found via the online [Module Catalogue](#). The accuracy of the information contained in this document is reviewed regularly by the university, and may also be checked routinely by external agencies, such as the Quality Assurance Agency (QAA).

Your course will be reviewed regularly, both by the university as part of its cyclical quality enhancement processes, and/or by your department or school, who may wish to make improvements to the curriculum, or in response to resource planning. As such, your course may be revised during the course of your study at Royal Holloway. However, your department or school will take reasonable steps to consult with students via appropriate channels when considering changes. All continuing students will be routinely informed of any significant changes.

### Section 11 – Intermediate exit awards (where available)

You may be eligible for an intermediate exit award if you complete part of the course as detailed in this document. Any additional criteria (e.g. mandatory modules, credit requirements) for intermediate awards is outlined in the sections below.

| Award                                    | Criteria   | Awarding body                          |
|--|--|--|
| Diploma in Higher Education (DipHE)      | Pass in 210 credits of which at least 90 must be at or above FHEQ Level 4 and at least 120 of which must be at or above FHEQ Level 5 | Royal Holloway and Bedford New College |
| Certificate in Higher Education (CertHE) | Pass in 120 credits of which at least 90 must be at or above FHEQ Level 4  | Royal Holloway and Bedford New College |

**Section 12 - Associated award(s)**

BSc Mathematics and Physics (GF13)

MSci Mathematics and Physics (GFC3)