

Royal Holloway, University of London

Programme specification for an undergraduate award

BSc Mathematics and Physics (GF13)

Section 1 – Introduction to your programme

This programme specification is a formal document, which provides a summary of the main features of your programme 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 programme 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 courses to the value of 120 credits.

In stage one the mandatory courses 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 courses, which continue your study of abstract pure mathematics and its applications. In stage three, you choose courses 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 programmes, please refer to the programme specification for your secondary department's corresponding single honours programme for further information on educational aims, and learning outcomes.

While Royal Holloway keeps all the information made available under review, programmes and the availability of individual course units, especially optional course units 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 programme. 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 programme – Also referred to as 'degree course' or simply 'course', these terms refer to the qualification you will be awarded upon successful completion of your studies.

Course unit – Also referred to as 'module', this refers to the individual units you will study each year to complete your degree programme. Undergraduate degrees at Royal Holloway comprise course units to the value of 120 credits per year. On some degree programmes a certain number of optional course units must be passed for a particular degree title.

Section 2 – Programme details			
Date of specification update	April 2019	Location of study	Egham Campus
Programme award and title	BSc Mathematics and Physics	Level of study	Undergraduate
Programme code	1280	UCAS code	GF13
Year of entry	2019/20		
Awarding body	Royal Holloway, University of London		
Department or school	Mathematics	Other departments or schools involved in teaching the programme	Physics
Mode(s) of attendance	Full-time	Duration of the programme	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:	https://www.royalholloway.ac.uk/studying-here/	For queries on admissions:	study@royalholloway.ac.uk .

Section 3 – Degree programme structure										
3.1 Mandatory course unit information										
The following table summarises the mandatory modules which students must take in each year of study										
Year	Course code	Course title	Contact hours*	Self-study hours	Written exams**	Practical assessment**	Coursework**	Credits	FHEQ level	Course status (see below)
1	MT1710	Calculus	47	103	80%	0	20%	15	4	MC
1	MT1720	Functions of Several Variables	44	106	90%	0	10%	15	4	MC
1	MT1810	Number Systems	44	106	80%	0	20%	15	4	MC
1	MT1820	Matrix Algebra	44	106	90%	0	10%	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 Analysis and Fluids	33	117	90%	0	10%	15	5	MC
2	MT2720	Mathematics: Differential Equations & Fourier Analysis	33	117	90%	0	10%	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: Experimental/Theoretical 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 courses on your degree programme. These courses are central to achieving your learning outcomes, so they are compulsory, and all students on your degree programme will be required to take them. You will be automatically registered for these courses each year. Mandatory courses fall into two categories; 'condonable' or 'non-condonable'.

In the case of mandatory 'non-condonable' (MNC) courses, you must pass the course before you can proceed to the next year of your programme, or to successfully graduate with a particular degree title. In the case of mandatory 'condonable' (MC) courses, 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 programme 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 programme 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 course on your degree programme 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 course, and potentially your degree classification, depending on your year of study. On successful completion of the course 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 course.

3.2 Optional course units

In addition to mandatory course units, there will be a number of optional course units available during the course of your degree. The following table lists a selection of optional course units 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 programme 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	Mathematics: MT3090 Mathematics In The Classroom
	Mathematics: MT2320 Probability	Mathematics: MT3110 Number Theory
	Mathematics: MT2630 Graphs and Optimisation	Mathematics: MT3120 Computational Number Theory
	Mathematics: MT2830 Rings and Factorisation	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 <u>Non-Linear Dynamical Systems: Routes to Chaos.</u>

3.3 Optional course unit requirements

At stage two, you must take options to the value of 30 credits from stage two courses offered by the Department of Mathematics.
 At stage three, you must choose optional courses as appropriate from the list of stage three courses offered by the Departments to ensure you take 60 credits of courses in Maths and 60 credits of courses in Physics. Some course units in stage three may be counted as a Maths OR a Physics course, and you should seek advice from your personal tutor when choosing courses to ensure you have the correct balance between the two subjects.

Section 4 - Progressing through each year of your degree programme

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 programme you may also be required to complete a course to develop your academic writing skills. This course does not carry credit but passing it is a requirement to progress to the next year of study.

Section 5 – Educational aims of the programme

The aims of this programme 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 course units 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 - Programme learning outcomes	
<p>In general terms, the programmes 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"> 1. Of mathematical methods (K); 2. Of mathematical concepts such as number and function (K); 3. Of abstract structures such as groups, matrices, and fields (K); 4. Of some results from a range of major areas of mathematics, statistics or operational research (K); 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 (K); 6. A high level of numeracy (S); 7. Ability to manipulate and analyze complex mathematical expressions accurately (S); 8. Ability to understand the role of logical mathematical argument and deductive reasoning, including formal proof (S); 9. Familiarity with computer methods in mathematics and statistics (S); 10. Ability to formulate problems in mathematical or statistical form using appropriate notation (S); 11. The ability to solve equations or inequalities arising from a problem analytically or numerically, and to interpret the results (S); 	<ol style="list-style-type: none"> 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 (S); 13. Ability to take theoretical knowledge gained in one area and apply it elsewhere (S); 14. Ability to make a sequence of logical steps, and reflect on the result (S); 15. Ability to communicate mathematical results clearly, to both mathematicians and lay persons (S); 16. Spatial awareness in two and three dimensions (S); 17. Good general skills of time-management and organization (S*); 18. To learn independently, using a variety of media including books, learned journals, the internet etc (S*); 19. To work independently with persistence and patience, pursuing the solution of problems to their conclusion (S*); 20. Develop IT skills, including word-processing and use of the internet (S*); 21. Personal motivation and the planning of a career path (S*); 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 (S*); 23. Ability to work together with others as a team (S*).

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 courses in-term tests, projects, coursework essays and oral presentations. Full details of the assessment methods for individual courses may be obtained from the Department.</p>

Section 8 – Additional costs	
£55 (Physics)	
These estimated costs relate to studying this particular degree programme 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.	

Section 9 – Indicators of quality and standards	
QAA Framework for Higher Education Qualifications (FHEQ) Level	4-6
Your programme 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 programmes of study.	
QAA Subject benchmark statement(s)	http://www.qaa.ac.uk/quality-code/subject-benchmark-statements
Subject benchmark statements provide a means for the academic community to describe the nature and characteristics of programmes 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 programme 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 course units, including teaching and learning methods, and methods of assessment, can be found via the online [Course 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 programme 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 programme 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 programme as detailed in this document. Any additional criteria (e.g. mandatory course units, 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)