Royal Holloway, University of London
Course specification for an undergraduate award
MSCI MATHEMATICS AND PHYSICS (GFC_3)

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 MSci Mathematics and Physics is delivered in four 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. In Stage four, you must undertake the project module MT4000 (30 credits) or PH4100 and choose options as appropriate so that you take 60 credits worth of FHEQ Level 7 modules in Maths and 60 credits worth of FHEQ Level 7 modules in Physics.

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.

The following is a 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	February 2024	**Location of study**	Egham Campus
Course award and title	MSci Mathematics and Physics	**Level of study**	Undergraduate
Course code	2265	**UCAS code**	GFC3
Year of entry	2026/27		
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**	4 years
Accrediting Professional, Statutory or Regulatory Body requirement(s)	Institute of Physics (IOP) - successful completion of the MSci Mathematics and Physics (including passing PH4100) will enable students to fully 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:**	https://royalholloway.ac.uk/applicationquery

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**	**Credits**	**FHEQ level**	**Module status (Mandatory Condonable MC or Mandatory Non-Condonable MNC**
1	MT1710	Calculus I	15	4	MC
1	MT1720	Calculus II	15	4	MC
1	MT1810	Introduction to Pure Mathematics	15	4	MC
1	MT1820	Linear Algebra I	15	4	MC
1	PH1141	Physics: Scientific Skills	15	4	MC
1	PH1320	Physics: Classical Mechanics	15	4	MC
1	PH1620	Physics: Classical Matter	15	4	MC
1	PH1920	Physics: Physics of the Universe	15	4	MC
2	MT2220	Mathematics: Vector Calculus	15	5	MC
2	MT2720	Mathematics: Ordinary Differential Equations & Fourier Analysis	15	5	MC
2	MT2800	Linear Algebra II	15	5	MC
2	PH2150	Physics: Scientific Computing Skills	15	5	MC
2	PH2210	Physics: Quantum Mechanics	15	5	MC
2	PH2610	Physics: Classical and Statistical Thermodynamics	15	5	MC
2	PH2710	Physics: The Solid State	15	5	MC
3	PH2310	Physics: Optics	15	5	MC

3	PH2420	Physics: Electromagnetism	15	5	MC
3	PH3010 Or MT3050	Physics: Advanced Skills Mathematics: Advanced Skills	15	6	MNC
4	MT4000 Or PH4100	MSci Project Major Project	30	7	MNC
4	PH4110	Physics: Research Review	15	7	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. For PH2310 and PH2420 only a fail outcome of 30% or higher can be condoned. 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.

3.2 Optional modules

In addition to mandatory modules, there will be a number of optional modules available during the course of your degree. 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; please contact the Department for further information.

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 Mathematics and 60 credits of modules in Physics. PH3010 Advanced Skills may be counted as a Physics OR Mathematics module, and you should seek advice from your personal tutor when choosing modules to ensure you have the correct balance between the two subjects At stage four, you must choose optional modules as appropriate from the list of stage 4 modules offered by the Departments to ensure you take 60 credits of modules in Mathematics and 60 credits of modules in Physics

Section 4 - Progressing through each year of your degree course

If after Stage 3 you fail to progress onto Stage 4 and also fail to graduate with a BSc degree but pass MT3050/PH3010 you are exempt from taking the Experimental or Theoretical Project (MT3020/PH3110) if you retake Stage 3 as a BSc student.

For further information on the progression and award requirements for your degree, please refer to Royal Holloway's Academic Regulations.

Progression throughout the year/s is monitored through performance in summative or formative coursework assignments. Please note that if you hold a Student Visa and you choose to leave (or are required to leave because of non-progression) or complete early (before the course end date stated on your CAS), then this will be reported to UKVI.

All first year undergraduate students are required to take and pass the non-credit bearing Moodle-based Academic Integrity module SS1001 in order to progress into the second year of study (unless their course includes the alternative mandatory SS1000 module). The pass mark for the module assessment is stated in the on-line Academic Integrity Moodle module. Students may attempt the assessment as often as they wish with no penalties or capping. Students who meet the requirements for progression as stipulated in the Academic Taught Regulations but fail to pass the Moodle-based Academic Integrity module will not be permitted to progress into their second year of academic 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

In general terms, the courses provide opportunities for students to develop and demonstrate the following learning outcomes. (*Categories – Knowledge and understanding (K), Skills and other attributes (S), and Transferable skills (*)*)

Course Learning outcome	Level 4	Level 5	Level 6	Level 7
1: Gain knowledge and understanding of mathematical concepts, mathematical methods, and abstract mathematical structures, and understand the core areas of physics, i.e., electromagnetism, quantum and classical mechanics, statistical physics and thermodynamics, wave phenomena and the properties of matter (K)	1.4.1: Develop knowledge and understanding of mathematical methods. 1.4.2: Start to develop knowledge and understanding of abstract structures such as groups, matrices, and fields. 1.4.3: Understand some core areas of classical physics 1.4.4: Show awareness of non-classical phenomena	1.5.1: Embed knowledge and understanding of mathematical methods. 1.5.2 Embed knowledge of the abstract theory of matrices. 1.5.3: Understand core areas of classical physics including its basic laws and principles. 1.5.4: Understand some areas of non-classical physics	1.6.1: Extend knowledge and understanding of mathematical methods. 1.6.2 Extend knowledge of abstract structures such as groups. 1.6.3: Understand the core areas of classical physics 1.6.4: Understand the core areas of non-classical physics including its basic physical laws and principles	1.7.1 Gain a deeper knowledge and understanding of mathematical methods. 1.7.2 Extend knowledge of abstract structures and proofs.
2: Grow an understanding of results from a range of areas of mathematics and physics and how they are key to some applications, and demonstrate an appreciation of recent developments in physics (K)	2.4.1: Develop the ability to take theoretical knowledge gained in one area and apply it elsewhere.	2.5.1: Develop knowledge and understanding of some results from a range of major areas of mathematics, statistics or operational research.	2.6.1: Develop knowledge and understanding of at least one major area of applications in which the mathematics is used in a serious manner and is essential for proper understanding. 2.6.2: Apply core physics principles to diverse areas of Physics 2.6.3: Demonstrate an appreciation of recent developments in physics	2.7.1: Develop deeper knowledge and understanding of at least one major area of applications in which the mathematics is used in a serious manner and is essential for proper understanding. 2.7.2: Apply core physics principles to areas informed by the forefront of physics 2.7.3.: Show awareness of research-level material
3: Develop skills of numeracy, manipulation of mathematical expressions, and the analytic approach to solving problems. (K)	3.4.1: Apply a high level of numeracy. 3.4.2: Develop the ability to manipulate and analyse complex mathematical expressions accurately.	3.5.1: Grow the ability to manipulate and analyse complex mathematical expressions accurately. 3.5.2: Develop a general ethos of numeracy and of analytical approaches to problem solving.	3.6.1: Develop the ability to provide accurate analysis of a situation, the factors involved and possible approaches to solution.	3.7.1: Develop further the ability to provide accurate analysis of a situation, the factors involved and possible approaches to solution.

4: Develop the ability to argue and tackle intricate problems logically and accurately, and to understand the role of formal proofs. (S)	4.4.1: Develop the ability to make a sequence of logical steps, and reflect on the result. 4.4.2: Pay attention to detail	4.5.1: Develop the ability to construct logical arguments and to understand the role of logical mathematical argument and deductive reasoning, including formal proof. 4.5.2: Use technical language correctly	4.6.1: Manipulate precise and intricate ideas and embed the ability to understand the role of logical mathematical argument and deductive reasoning, including formal proof.	4.7.1: Extend the ability to understand the role of logical mathematical argument and deductive reasoning, including formal proof.
5: Apply mathematical and computational techniques to model, describe and predict physical behaviour (S)	5.4.1: Understand mathematical techniques 5.4.2: Remember how to interpret information from numerical manipulation graphically	5.5.1: Apply mathematical techniques to model and describe physical behaviour 5.5.2: Apply computational techniques to model, describe and predict physical behaviour	5.6.1: Apply mathematical techniques to predict physical behaviour	5.7.1: Apply mathematical techniques in current research and applications 5.7.2: Apply computational techniques in current research and applications
6: Develop the ability to formulate complex problems in mathematics and physics, to solve the resulting problems, and to interpret the results. (S)	6.4.1: Begin to develop the ability to formulate problems in mathematical or statistical form using appropriate notation and by identifying relevant principals and laws. 6.4.2: Begin to develop the ability to solve equations or inequalities arising from a problem analytically or numerically, and to interpret the results.	6.5.1: Develop the ability to formulate problems in mathematical or statistical form using appropriate notation. 6.5.2: Develop the ability to solve problems by selecting and using appropriate mathematical and physical techniques and to solve equations or inequalities arising from a problem analytically or numerically and by making appropriate approximations, and to interpret the results.	6.6.1: Grow the ability to formulate complex problems in unrehearsed contexts by applying physics knowledge across topic boundaries and in mathematical or statistical form using appropriate notation. 6.6.2: Grow the ability to solve equations or inequalities arising from such problems analytically or numerically, and to interpret the results.	6.7.1: Extend the ability to formulate problems in mathematical or statistical form using appropriate notation 6.7.2: Extend the ability to solve equations or inequalities arising from a problem analytically or numerically, and to interpret the results. 6.7.3.: Solve advanced research-informed problems in physics
7: Plan, design and safely execute an effective experiment or investigation, and critically analyse its results (S)	7.4.1: Safely execute an experiment or investigation 7.4.2: Analyse its results by evaluating their level of uncertainty		7.6.1: Plan, design and safely execute an effective experiment or investigation 7.6.2: Critically analyse its results, compare them with expected outcomes, theoretical and computational models, evaluate their significance and set them in	7.7.1: Plan, design and safely execute an extended effective experiment or investigation that includes the use of techniques applicable to current research or applications in physics

			context by comparison with published data	
8: Carry out elements of independent investigative work of an open-ended nature that demonstrates creativity (S)			8.6.1: Show creativity to carry out independent investigative work of an open-ended nature 8.6.2: Use new techniques in a theoretical, computational or experimental context	8.7.1: Plan and execute a substantial open-ended research project that demonstrates some originality 8.7.2: Master new techniques, including the competent use of specialised equipment or research grade software or methods. 8.7.3: Understand and evaluate current research at the forefront of the discipline and suggest realistic future directions.
9: Gain the ability to work as a team, and to communicate scientific results clearly, concisely, and accurately to others. (*)	9.4.1: Communicate basic scientific information accurately and with some clarity. 9.4.2: Contribute to discussions. 9.4.3: Work together with others as a team.	9.5.1: Develop the ability to communicate mathematical results clearly, concisely and accurately. 9.5.2: Develop good written and oral communication skills, which enable them to write coherently and contribute to discussions. 9.5.3: Continue to work together and interact constructively with others as part of a team.	9.6.1: Extend the ability to communicate mathematical results clearly, concisely and accurately to both mathematicians and lay persons, including through scientific reports. 9.6.2: Continue to develop good written and oral communication skills, which enable them to write coherently, turn a rough draft into a convincing argument and contribute to discussions. 9.6.3: Extend skills to work and interact constructively as part of a team and by taking the lead	9.7.1: Continue to extend the ability to communicate complex scientific content, including the conclusions of an experiment, investigation or project, clearly to both experts and lay persons. 9.7.2: Produce an extended piece of mathematical writing, and summarise it to others in a presentation. 9.7.3: Continue to develop team-
10: Develop a career plan. (*)	10.4.1: Develop the skill of personal motivation and start the process of planning a career path.	10.5.1: Develop employability skills, including personal motivation and the planning of a career path.	10.6.1: Continue to improve employability skills, and the planning of a career path.	10.7.1: Continue to improve employability skills, and the planning of a career path.

11: Gain familiarity with computer methods in mathematics, and exploit ICT skills, including appropriate software packages/ systems for the analysis of data, simulation of physical systems and the retrieval of appropriate information (*)	11.4.1: Introduce computer methods in mathematics and statistics. 11.4.2: Develop ICT skills, including word-processing, use of the internet, and awareness of appropriate software packages/ systems for the analysis of data, simulation of physical systems and the retrieval of appropriate information	11.5.1: Gain familiarity with computer methods in mathematics and statistics. 11.5.2: Embed ICT skills, including word-processing, use of the internet, and use of appropriate software packages/ systems for the analysis of data, simulation of physical systems and the retrieval of appropriate information	11.6.1: Extend the use of computer methods in mathematics and statistics. 11.6.2: Exploit ICT skills, including mathematical word-processing, use of the internet, and use of appropriate software packages/ systems for the analysis of data, simulation of physical systems and the retrieval of appropriate information	11.7.1: Extend further the use of computer methods in mathematics and statistics. 11.7.2: Extend IT skills, including mathematical word-processing of a lengthy piece of mathematics.
12: Develop the skill to work independently, manage their own learning including time management and critically evaluate complex information using a variety of resources, including research based materials (*)	12.4.1 Develop the ability to learn independently by being organised and meeting deadlines 12.4.2: Show awareness of investigative skills including curiosity 12.4.3: Make use of information including appropriate texts and online learning materials	12.5.1 Grow the skill to learn independently, including by taking the initiative 12.5.2: Use investigative skills including the ability to adapt their own learning 12.5.3: Make sense of information including books, learned journals and online learning materials	12.6.1 Extend the skill to manage their own learning and work independently with persistence and patience, pursuing the solution of problems to their conclusion. 12.6.2: Show the ability to focus 12.6.3 Manage and use research-based materials	12.7.1 Extend further the skill to work independently with persistence and patience, pursuing the solution of problems to their conclusion. 12.7.2: Interpret and contextualise mathematical descriptions of physical phenomena.
13: Work and behave professionally including with integrity (*)	13.4.1: Work with integrity	13.5.1: Work with empathy	13.6.1: Embed social conscience in the evaluation of your work	

Section 7 - Teaching, learning and assessment

Teaching and learning on your course is closely informed by the active research of staff, particularly in the areas of Mathematics. In general terms, the course provides an opportunity for you to develop and demonstrate the learning outcomes detailed herein.

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. Assessment of knowledge and understanding is typically by formal examinations, coursework, examined essays, exercises, online tests and exercises, oral presentations and the dissertation or long essay. In addition, students may be involved in workshops and may produce various forms of creative work.

Contact hours come in various 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

More detailed information on modules, including teaching and learning methods, and methods of assessment, can be found via the online Royal Holloway Curriculum 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).

Section 8 – Additional costs

There are no single associated costs greater than £50 per item on this degree course.

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.

Section 9 – Indicators of quality and standards	
QAA Framework for Higher Education Qualifications (FHEQ) Level	4-7
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.	
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 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– 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**
BSc in Mathematics and Physics	In addition to the requirements by the Academic Regulations a pass in MT3050/PH3010 will be required to be eligible for a BSc degree accredited by the Institute of Physics. Otherwise, only an unaccredited BSc degree can be awarded.	Royal Holloway and Bedford New College
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