

Programme Specification

MPhys Physics and Mathematics

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 full advantage is taken of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in Module Specifications and other programme documentation and online at <http://www.lboro.ac.uk/>
The accuracy of the information in this document is reviewed by the University and may be checked by the Quality Assurance Agency for Higher Education.

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| Awarding body/institution; | Loughborough University |
| Department; | Physics |
| Teaching institution (if different); | |
| Details of accreditation by a professional/statutory body; | Provisional accreditation by the Institute of Physics (full accreditation is expected when the first cohort of students graduate). |
| Name of the final award; | MPhys |
| Programme title; | Physics and Mathematics |
| UCAS code; | FG3C/FG3D |
| Date at which the programme specification was written or revised. | 3 rd Jan 2008 |

1. Aims of the programme:

To communicate to students the laws and phenomena that comprise the world view of the physicist.

To educate students as physicists and mathematicians in preparation for employment in industry, public service or academic research by providing the knowledge, competence and skills expected of a physicist.

To enable students to apply a broad understanding of the basic principles of physics to the solution of physical problems.

To provide students with a solid foundation of the core areas of mathematics and allow students to further their own mathematical interests through module selection.

To provide the student with enhanced skills in computing, problem solving, experimental techniques, scientific report writing and the collection and analysis of information.

To provide the student with enhanced skills in presenting information and the use of information technology.

To provide an environment that gives students opportunities to develop their own interests, self-reliance and career aspirations.

2. Relevant subject benchmark statements and other external and internal reference points used to inform programme outcomes:

The national benchmark statement for Physics

The benchmark statement for MSOR

Institute of Physics degree accreditation guidelines

University Teaching and Learning Strategy

Framework for Higher Education Qualifications

3. Intended Learning Outcomes

Knowledge and Understanding:

The MPhys degree programme in Physics and Mathematics covers the fundamental topic of physics and provides a sound foundation in mathematical sciences. It provides a selection of advanced topics and develops experimental, mathematical, computational and other transferable skills. On successful completion of this programme students should have demonstrated

1. Knowledge and understanding of most fundamental physical laws and principles and competence in the application of these principles to diverse areas of physics.
2. An ability to solve problems in physics using appropriate mathematical tools.
3. An ability to identify physical principles relevant to a problem and to make approximations necessary to obtain solutions.
4. An ability to execute and analyse critically the results of an experimental investigation and to draw valid conclusions with an estimate of the uncertainty in the result. The ability to critically compare experimental results with the predictions of theory.
5. An ability to use competently IT packages and a knowledge of the use of mathematical software in problem solving.
6. An ability to communicate scientific information especially in the form of clear and accurate scientific reports.
7. An understanding of core concepts in mathematics

Successful students will possess skills required by the professional mathematician or physicist in industry, commerce and higher education.

Teaching, learning and assessment strategies to enable outcomes to be achieved and demonstrated:

Knowledge and understanding of areas 1 – 3, and 7 is acquired through lectures, tutorials, problem classes and guided independent study. The practically oriented knowledge of areas 4 – 6 is acquired in practical classes, both experimental and computing, and associated lectures.

Areas 1-3 and 7 are assessed by examinations and coursework. Areas 4 –6 are mainly assessed by coursework supplemented by written and viva voce examinations.

Skills and other attributes:

a. Subject-specific cognitive skills:

On successful completion of the programme students should be able to

1. Demonstrate knowledge and understanding of essential facts, concept, principles and theories relating to the areas listed in section 3.
2. Apply such knowledge and understanding to the solution of qualitative and quantitative problems of a familiar and unfamiliar nature.
3. Recognise and analyse novel problems and plan strategies for their solution.
4. Evaluate, interpret and collate information and data
5. construct logical mathematical arguments
6. relate mathematics to physical processes, and thus obtain quantitative and qualitative information about the real world.

Teaching, learning and assessment strategies to enable outcomes to be achieved and demonstrated:

Cognitive skills are promoted by lectures, practical work, tutorials and supervision of advanced work in the final year and by guided independent study.

Cognitive skills are assessed by examinations and coursework. Examinations show how well a student can understand and apply an area of knowledge by applying their knowledge and understanding to an unseen question in a limited time period. Coursework allows the student to demonstrate wider skills by incorporating experimental skills, literature research, report writing skills and presentation skills in the assessment. In the final year the student demonstrates all of the above skills in an academic research project that may be theoretically or experimentally based..

b. Subject-specific practical skills:

On successful completion of the programme students should be able to

1. Observe, accurately record and analyse, including estimates of accuracy, the results of experiments into physical processes.
2. Design an experiment to test a physical theory.
3. Communicate ideas effectively by means of written reports and orally.
4. Plan and execute a research project on a topic of current scientific interest.
5. Explain, in non-technical terms, the logic underlying ideas in mathematics.
6. relate mathematics to physical processes, and thus obtain quantitative and qualitative information about the real world.

Teaching, learning and assessment strategies to enable outcomes to be achieved and demonstrated:

Practical skills are promoted through laboratory and project work. In Parts A and B students are taught in practical classes; in Part D they undertake a research project under the supervision and guidance of a staff member. Part A and B assessment is via coursework, mainly in the form of written reports and discussions of experimental work with staff members. In Part D the research project is assessed by report, viva voce examination and research presentation. Practical and analytical skills are taught in practical laboratory and computing laboratory sessions.

c. Key/transferrable skills:

On successful completion of the programme students should be able to

1. Formulate problems in precise terms and identify key issues, construct logical arguments and use technical language correctly.
2. Use standard IT packages (wordprocessors, spreadsheets) and write computer programmes.
3. Listen carefully, read demanding texts and present complex information in a clear and concise manner.
4. Demonstrate study skills for continuing professional development.
5. Demonstrate retrieval skills for directly taught and independently acquired information and for primary as well as secondary information sources.

Teaching, learning and assessment strategies to enable outcomes to be achieved and demonstrated:

Study skills information is provided to each student on arrival. Students should have gained an understanding of how to clearly report experimental methodology, observations and results including the analysis of qualitative and quantitative data through written reports and their feedback. Tutorials and presentations provide an opportunity to develop skills in the oral and written presentation of information

from directly taught and independently acquired information, and for primary as well as secondary information sources. Group Coursework aids interpersonal skills by interaction with other people and engagement in team-working to develop arguments and problem solve. Timetabled laboratory classes, practical sessions and published coursework deadlines train students in time management and organisational skills.

4. Programme structures and requirements , levels, modules, credits and awards:

In Parts A and B students take 60 credits of Physics modules and 60 credits of Mathematics modules. This ensures that students have the core knowledge necessary to take a wide variety of Physics and Mathematics modules in later years. In Parts C and D the required minimum in either discipline reduces enabling students to lean towards either Physics or Mathematics and make them major components of their degree if they so wish.

More detail can be found at:

<http://www.lboro.ac.uk/departments/ph/teaching/programmes/phm.html>

Full details are to be found in the Programme Regulations:

<http://www.lboro.ac.uk/departments/ph/teaching/regs/current/phmr.pdf>

5. Criteria for admission to the programme:

A-Level qualifications: 300 points normally to include a minimum of grade C in Physics and Maths at A-Level (A2) or equivalent. Mature candidates and candidates with other qualifications are invited to apply. All applications will be considered on their merits.

6. Information about assessment regulations:

Most modules are assessed by a mixture of written examination and coursework and some will include practical assessment .

Students follow modules weighted at 120 credits per year. In order to progress to the next year of the programme, or to be awarded a degree at the end of Part D, students must, each year, accumulate at least 100 credits. Pass mark of 40% is applied to each module. To progress from Part A to Part B, candidates must also achieve a mark of at least 30% in all modules. To progress from Part B to Part C of the MPhys programme, candidates must achieve a mark of 50% averaged over all modules. A candidate who fails to achieve this, after any reassessment, but who has achieved 100 credits in Part B may progress to Part C of the BSc programme.

Any candidate who has successfully completed Part C of the MPhys programme but fails to complete Part D may at the discretion of the Programme Board be awarded the degree of BSc in Physics and Mathematics. The relative weightings of Parts B and C in the degree mark will be the same as in the BSc programme.

In addition students must obtain a minimum of 30% in core Physics and Mathematics modules.

Any student who fails to meet these module requirements has the automatic right of reassessment on one occasion only. Candidates are permitted to undertake reassessment in modules which, if passed, would give them a maximum of 100 credits (unless a candidate has achieved 90 credits with one 10 credit module and

one 20 credit module, when they may take the 20 credit module). Students can opt for reassessment in either the September following the end of the academic year or during the course of the following academic year. However, some modules (chiefly those involving practical work) are **not** available in September. Students who are reassessed in the following year may choose to take the reassessment with or without tuition. Students who are reassessed with tuition are required to take both coursework and examination components of the module (and the new mark supersedes the original mark). Students who are reassessed without tuition may be allowed to carry forward the component which has been passed. The overall mark, averaged over coursework and examination, for reassessed modules is capped at 40%.

7. What makes the programme distinctive:

The programme is designed for students who wish to gain a good understanding of physical phenomena whilst gaining the mathematical techniques for solving a wide range of theoretical and computational problems. The mathematics content is slanted towards areas of applied mathematics relevant to physics and engineering.

The optional sandwich year provides the opportunity either to study abroad for a year (in another European country or in Australia) or to work in an industrial or research environment for a year. The year of study abroad introduces students to a new academic and cultural environment and complements their studies by offering subjects that may not be covered at Loughborough and developing language and other skills. The industrial placement exposes students to a workplace environment and develops skills such as personal management, communication and team working.

Students opt for a Physics or Mathematics project in their final year (but not both). The Physics project takes up half of the final year (60 credits); this is usually carried out in the Department but can be carried out in industry, at a research institution or in a University abroad.

8. Particular support for learning:

i) Departmental Support

The department has an integrated structure for the management, appraisal and planning of teaching and learning. This is comprised of a Director of Teaching who manages the teaching committee and has overall responsibility for teaching matters, Programme Tutors who have responsibility for the academic content and the general organisation of the programmes, and Personal Tutors, who are responsible for matters relating to a student's academic welfare.

On the first day of their academic studies, students receive a handbook from the department with important information including the management structure of the department, programme specifications and general points relating to coursework and examination. The students are also assigned a personal tutor who is responsible for their personal welfare who arranges to see them during the first semester. Thereafter the personal tutor arranges to see their tutees at important times, such as after examinations, or when problems have been raised in respect to the tutees by module organisers, Programme Tutors or the Director of Teaching. The personal tutor is available for consultation by a student at all reasonable times.

The Physics Department has a well-equipped computer room/resource centre with self-teaching packages and books, notes and other documents related to the physics modules. In addition to the self help facilities the centre is staffed one day per week in order to assist students with problems they have related to their physics work. Past exam papers are placed on the LEARN server and many members of the department place lecture notes, problems and answers to past exam papers and background reading lists on this facility.

ii) University Support

Please refer to <http://www.lboro.ac.uk/admin/ar/templates/notes/lps>