LOUGHBOROUGH UNIVERSITY

DEPARTMENT OF PHYSICS

PROGRAMME HANDBOOK

for

MSc Research Studies (in Physics)

This document is for guidance purposes only. Students should always consult the current version of the Programme Regulations.

2011/12

Table of Contents

1. Introduction

We welcome you to the University and give you our best wishes for a rewarding time here.

This document tells you the minimum you need to know about your chosen programme of study. It gives information specific to the degree programme Research Studies (in Physics), which has a duration of one year full time.

The most urgent part is the advice given here about choosing optional modules (which is something you need to do more or less immediately). You should look through it at your first opportunity, in conjunction with the University *Student Handbook* and *Departmental Handbook* for Physics. If there is anything more you need to know, do ask (after checking to see that the information is not in one of these documents or on the web). You should also consult the relevant notice boards in the Department regularly. A summary of the various sources of information is given in section 2 below.

The Department of Physics is responsible for the administration of this programmes. In the next few pages you will find a list of those people most concerned with the administration of the programmes, our *Aims* and *Intended Learning Outcomes* (what the programmes are for, and what we hope you will get out of your time here) and a brief description of the content of each year. The *Programme Regulations* define the structure and content of the programme, and the *Module Specifications* describe the content of each module in more detail.

2. Sources of information

You will either be given the following, or will be able to access them through the Physics department web site `http://www.lboro.ac.uk/departments/ph/`. Bookmark them now!

The Physics Department Handbook
This was given to you at induction. It gives information that is of common interest to students on all the Department's programmes.

The "Welcome to Loughborough University" Booklet
This was sent to you before you arrived at Loughborough.

Your Programme Handbook
That's this document. It tells you about the content of your own programme.

Programme Regulations
These specify the requirements for the degree programme: which modules are compulsory, which options are available, what you need to do to pass, etc. The details (such as option choices) will change from year to year, and the current version is accessible from the Physics web site.

Programme specifications
These have further information about each degree programme and how the knowledge and skills you will acquire are delivered.

Module specifications ("modspecs")
These give the content for each module, the intended learning outcomes (what we expect you will get out of the module), a partial reading list and other useful information. You have the modspecs for the modules you will be taking this year in your folder. You can consult the full list of the University's modules at `http://lusi.lboro.ac.uk/epublic/wp5015.main`, or `http://lusi.lboro.ac.uk/epublic/wp5016.main?dept=PH&dept2=PH` for modules taught by Physics.

The Learn server
Resources for many of your modules are on the web at `http://learn.lboro.ac.uk/`, or will be placed there as the semester progresses.

The Student Handbook
This is on the web at
`http://www.lboro.ac.uk/admin/ar/student/handbook/index.htm`.
It covers the University's facilities, regulations and policies. You will need to look at this.

The Study Guide
This is produced by Professional Development. It is available on the web at
`http://www.lboro.ac.uk/service/ltd/st_guide.htm`.

The Web
The University and the Physics Department have put a lot of useful information for students on the Web. The two most useful places to start are
`http://www.lboro.ac.uk/students/index.html` (for University information)
`http://www.lboro.ac.uk/departments/ph` (for Department information)
Networked PCs are available in W2.75, the library and, 24 hours a day, in various other places around campus.

3. Communication between staff and students

It's good to talk
A good time to catch members of staff is at the end of one of their lectures or in a teaching laboratory. If that is not convenient, then go and knock on their office doors and discuss your question or make an appointment; if they are not in, leave a message by email, under the office door or in the General Office (W212). You can check on a lecturer's whereabouts since timetables are often placed on staff office doors and will also be in the General Office.

Electronic Mail
This is often the easiest means of communication (unless your question requires a long discussion at the blackboard). Do check your e-mail frequently, preferably every day. For security and privacy reasons, we will only contact you through your `@student.lboro.ac.uk` address and not any other address you may have. All Physics staff check their email at frequent intervals; their addresses are listed in the Departmental handbook.

The Physics Department Noticeboards
The main noticeboards that you need to keep an eye on are the MSc Noticeboard and the General Noticeboard near the Second Year Laboratory (W2.24). You should check these frequently.

The Physics Department Pigeon Holes
For MSc students, mail and internal messages will be delivered to the General Office where there is a pigeon hole specifically for MSc students.

4. Staff

The people listed here have administrative responsibility for the programme. The complete Physics staff list is in the Physics Department Handbook. We are all here to help you; please don't hesitate to ask if you have any problems.

Responsibility	Name Email	Room Phone
Head of Department	Prof Feo (F V) Kusmartsev F.Kusmartsev@lboro.ac.uk	W215 223316
Administrator Timetables, module registrations, etc	Meredith Coney M.R.Coney@lboro.ac.uk	W184 222880
Programme Tutor (PH/EPH/PWM) Overall responsibility for programmes Advice on module choices	Dr Alexander (A G) Balanov A.Balanov@lboro.ac.uk	W135 227112
Staff Student Committee Chair	Dr John (J H) Samson J.H.Samson@lboro.ac.uk	W211 223304

5. Aims and Intended Learning Outcomes

Your programme has been designed with some specific aims and outcomes in mind. These are listed below and provide the motivation for the content of your degree programme, and list the knowledge and skills you should get out of it. They differ somewhat between programmes: consult the Programme Specifications for details.

5.1. Aims

The University's mission is “education, academic enquiry and the advancement of knowledge, to provide the highest quality of educational experience and the widest opportunities for students, to advance industry and the professions, and to benefit society”.

Within the context of this Mission Statement, the Department aims

1. To further the education of students in preparation for employment in industry, public service or academic research by enhancing their appropriate knowledge, competence and skills.
2. To provide students with an opportunity to apply their broad understanding of basic principles to the solution of a specific and detailed problem.
3. To provide the student with enhanced skills in: problem solving; experimental, mathematical or computational techniques; scientific report writing and presentation skills; obtaining and understanding information from the scientific literature; and the collection and analysis of data or the development of theoretical models.
4. To provide the student with an opportunity to enhance skills in the use of information technology for calculation, data analysis, control and the production of professional quality reports and presentations.
5. To provide an environment that gives students opportunities to develop their own interests, self-reliance and career aspirations.

5.2. Intended Learning Outcomes

5.2.1. Knowledge and Understanding

The taught postgraduate programme in Research Studies (in Physics) provides an opportunity to study in detail one of selection of advanced topics in current research. It develops experimental and/or mathematical, and/or computational and other transferable skills. On successful completion of this programme students should have demonstrated

1. Knowledge and understanding of some advanced topics in physics and/or other science discipline.
2. Specialised knowledge and understanding of one topic in current research and competence in the application of an experimental, theoretical or computational method to this topic.
3. An ability to execute an experiment, analyse critically the results and to draw valid conclusions, or to use mathematical or computational techniques to investigate physical phenomena.
4. The ability to critically compare experimental results with the predictions of theory.
5. An enhanced ability to use competently IT packages in research.
6. An ability to communicate scientific information especially in the form of clear and accurate scientific reports and presentations.

5.2.2. Skills and Attributes

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 1 and 2.
2. Apply such knowledge and understanding to the solution of qualitative and quantitative problems of a familiar and unfamiliar nature within these areas.
3. Recognise and analyse novel problems and plan strategies for their solution.
4. Evaluate, interpret and collate information and data.

Subject specific practical skills:

On successful completion of the programme students should be able to

1. Operate intelligently advanced physical research equipment and be able to design an experiment using that equipment.

   Or

1. Use theoretical or computational techniques and be able to apply them to solve physical problems is a selected area of physical research.

And

2. Communicate ideas effectively by means of written reports and orally.
3. Plan and execute a research project on a topic of current scientific interest.

Key/transferable 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 with greater proficiency scientific and standard IT
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.

6. Understanding your Programme Regulations

Your programme of study (i. e., your degree course), consists of a series of modules (individual subjects). In the year of the programme, you are required to take modules having a total modular weight of 180; modules have weight 10, 20 or 90. For each module the pass mark is 50%. If you get 50% or above in a module of modular weight 10 you accumulate 10 credits; if you get below 50% you get no credits for the module. You need **at least 150 credits to pass each year**; in addition, you need **at least 40% in all modules**.

The Programme Regulations contain the module codes and titles. These regulations and the range of modules offered can change from year to year. You will be supplied with updated regulations as needed.

The first two digits of a module code represent the academic year (so that 11 refers to the year 2011/12). The two letters indicate the Department responsible for the module: e.g. PH for *Physics* and MA for *Mathematical Sciences*. The third letter refers to the part of the programme in which the module is taught: letter P

refers to *Postgraduate Module*, and D refers to a fourth year *Undergraduate Degree Module*. In some departments (including *Physics* and *Mathematical Sciences*) the following digit gives the semester (1 or 2, or 3 for a module extending over two semesters).

It is the expectation that you will select only P and D modules, although in some circumstances it may be possible to select a C module by agreement with the Programme Tutor and Associate Dean (Teaching). You may make this selection from modules taught by any Department in the University subject to approval from the organiser of that module.

Regulations for the Postgraduate Programme in Research Studies (in Physics)

These programme regulations should be read in conjunction with University Regulation XXI and the relevant module specifications. Notice of change will be given by the Department responsible for the programme.

7. Structure

1.1 Administrative responsibility for the programme rests with the Department of Physics.

1.2 The award available is either the Master of Science (MSc) or Postgraduate Diploma (PGDip) or Postgraduate Certificate (PGCert).

1.3 The MSc programme in Research Studies (in Physics) is either 1 year by full-time study or 2 years by part-time study with the possibility of extending part-time study in accordance with Regulation XXI.

8. Content

8.1. Semester 1

8.1.1. Compulsory Modules (total Modular Weight 40)

Code	Title	Modular Weight
PHP180	Context of experimental research	20
Or		

PHP181	Context of theoretical research	20
PHP100	Mathematical Methods for Interdisciplinary Sciences	20

8.1.2. Optional Modules (total Modular Weight 20)

Code	Title	Modular Weight
PHC130	Fundamentals of Quantum Information	10
PHD105	Classical Mechanics	10
PHC102	Cosmology	10 (of 20)
PHD401	Applied Superconductivity and Nanoscience	10
PHP105	Quantum Phenomena	20
MPP353	Electronic Materials	10
MPP242	Microscopy	10

Or other modules from the University's catalogue by agreement with the Programme Tutor.

8.2. Semester 2

8.2.1. Compulsory Modules (total Modular Weight 30)

Code	Title	Modular Weight
Either		
PHP380	Experimental Research Project (Continues in summer period)	30 (of 90)
Or		
PHP381	Theoretical Research Project (Continues in summer period)	30 (of 90)

8.2.2. Optional Modules (total Modular Weight 30)

Code	Title	Modular Weight
PHD204	Superconductivity & Colossal Magnetoresistance Materials	10
PHD230	Quantum Computing	10
PHD205	Elementary Particle Physics	10

PHC102	Cosmology	10 (of 20)
	(continued from Semester 1)	

Or other modules from the University's catalogue by agreement with the Programme Tutor

8.3. Summer

8.3.1. Compulsory Modules (total Modular Weight 60)

Code	Title	Modular Weight
Either		
PHP380	Experimental Research Project (Continued from Semester 2)	60 (of 90)
Or		
PHP381	Theoretical Research Project (Continued from Semester 2)	60 (of 90)

8.4. Optional Modules

Not every optional module may be available in any one year. Some optional modules may require pre-requisite modules to be taken.

9. Assessment

9.1 Each module in the programme will be assessed, and credit awarded, in accordance with the levels of achievement specified in Regulation XXI.

9.2 The normal eligibility of candidates on the programme for the award of the Degree of Master, for the award of PGDip, for the award of PGCert, and for distinction where appropriate, will be in accordance with Regulation XXI.

9.3 Provision will be made, in accordance with Regulation XXI, for candidates who have the right for re-assessment to undergo re-assessment in the University's special assessment period where appropriate (not appropriate for PHP380 or PHP381).

10. Awards

10.1 Successful study will normally lead to a postgraduate award in Research Studies.

10.2 The title of the award will be suffixed by that specialization appropriate to the selection of topic for modules PHP180 or PHP181, PHP380 or PHP381, and optional modules as follows.

10.2.1 Research Studies: Experimental Condensed Matter Physics

10.2.2 Research Studies: Theoretical Condensed Matter Physics

10.2.3 Research Studies: Surface Physics

10.2.4 Research Studies: Materials Physics and Applications

10.2.5 Research Studies: Quantum Information and Computing

10.2.6 Research Studies: Security and Cryptography

10.2.7 Research Studies: Nanoscience

10.2.8 Research Studies: Quantum Structures and Phase Transitions

10.2.9 Research Studies: Cosmology and Astrophysics

10.2.10 Research Studies: Science of the Internet

10.2.11 Research Studies: Psychophysics

Curriculum Map

This map provides a design aid to help identify where programme outcomes are being developed and assessed within a programme

Modules																						
evel Part	Code	Title	C/O ***	Wt	K1	K2	K3	K4	K5	K6	C1	C2	C3	C4	P1	P2	P3	T1	T2	T3	T4	T5
7	PHP100	Mathematical Methods for Interdisciplinary Sciences	C	20	x					x	x			x		x		x		x	x	x
7	PHP180	Context of experimental research	C	20	x		x	x	x	x	x	x		x	x	x		x	x		x	
7	PHP181	Context of theoretical research	C	20	x	x	x		x	x	x	x	x			x		x			x	
7	PHD105	Classical Mechanics	O	10	x	x	x		x		x	x								x	x	
7	PHC130	Fundamentals of Quantum Information		10	x	x	x		x		x	x								x	x	
7	PHC102	Cosmology (in two semesters)	O	20	x	x	x			x	x	x				x		x		x		
7	PHD401	Applied Superconductivity and Nanoscience	O	10	x	x	x			x	x	x			x			x		x	x	
7	MPP353	Electronic Materials	O	10	x		x	x		x	x			x		x		x		x	x	x
7	MPP242	Microscopy	O	10	x		x	x		x	x			x		x		x		x	x	x
7	PHP380	Experimental Research Project	C	30	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x	x
7	PHP381	Theoretical Research Project	C	30	x	x	x		x	x	x	x	x		x	x	x	x	x	x	x	
7	PHD204	Superconductivity & Colossal Magnetoresistance Materials	O	10	x	x	x			x	x	x				x		x		x	x	
7	PHD230	Quantum Computing	O	10	x	x	x			x	x	x				x		x			x	
7	PHP380	Experimental Research Project	C	60	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x	x
7	PHP381	Theoretical Research project	C	60	x	x	x		x	x	x	x	x		x	x	x	x	x	x	x	

*** Compulsory/Optional. List compulsory modules for each part before optional modules.

Knowledge and Understanding

K1 Knowledge and understanding of some advanced topics in physics and/or other science discipline.

K2 Specialised knowledge and understanding of one topic in current research and competence in the application of an experimental, theoretical or computational method to this topic.

K3 An ability to execute an experiment, analyse critically the results and to draw valid conclusions, or to use mathematical or computational techniques to investigate physical phenomena.

K4 The ability to critically compare experimental results with the predictions of theory

K5 An enhanced ability to use competently IT packages in research

K6 An ability to communicate scientific information especially in the form of clear and accurate scientific reports and presentations.

Subject-specific cognitive skills

C1 Demonstrate knowledge and understanding of essential facts, concept, principles and theories relating to the areas listed in 1 and 2.

C2 Apply such knowledge and understanding to the solution of qualitative and quantitative problems of a familiar and unfamiliar nature within these areas.

C3 Recognise and analyse novel problems and plan strategies for their solution.

C4 Evaluate, interpret and collate information and data.

Subject-specific practical skills

P1 Operate intelligently advanced physical research equipment and be able to design an experiment using that equipment, or

use theoretical or computational techniques and be able to apply them to solve physical problems is a selected area of physical research.

P2 Communicate ideas effectively by means of written reports and orally.

P3 Plan and execute a research project on a topic of current scientific interest

Key/Transferable skill

T1 Formulate problems in precise terms and identify key issues, construct logical arguments and use technical language correctly

T2 Use with greater proficiency scientific and standard IT

T3 Listen carefully, read demanding texts and present complex information in a clear and concise manner.

T4 Demonstrate study skills for continuing professional development.

T5 Demonstrate retrieval skills for directly taught and independently acquired information and for primary as well as secondary information sources.

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