Programme Specification

MSc Photonic Technologies 2017-18

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 s/he takes full advantage of the learning opportunities that are provided.

Awarding Institution	University of Southampton
Teaching Institution	University of Southampton
Mode of Study	Full Time
Duration in Years	1 Year
Accreditation details	N/A
Final award	Master of Science
Name of award	MSc Photonic Technologies
Interim Exit awards	Postgraduate Diploma, Postgraduate Certificate
FHEQ level of final award	Level 7
UCAS code	N/A
QAA Subject Benchmark or other external reference	The UK Quality Assurance Agency's National Qualifications Framework for Higher Education Qualifications (FHEQ)
Programme Coordinator	Dr W.S. Brocklesby
Date specification was written	01/09/2015
Date specification last updated	30/03/2017

Programme Overview

Brief outline of the programme

The Optoelectronics Research Centre (ORC) has a leading international reputation for its research in Photonics, Metamaterials, and Optical Fibre Communications. This MSc programme offers an advanced postgraduate education covering these Photonic Technologies. A notable feature of the programme is that students will gain experience of working in research facilities including the Advanced Laser Laboratories, and the Mountbatten Clean Room.

Please Note: As a research-led University, we undertake a continuous review of our programmes to ensure quality enhancement and to manage our resources. As a result, this programme may be revised during a student's period of registration, however, any revision will be balanced against the requirement that the student should receive the educational service expected. Please read our **Disclaimer** to see why, when and how changes may be made to a student's programme.

Programmes and major changes to programmes are approved through the University's programme validation process which is described in the University's Quality handbook.

Learning and teaching

The program consists of eight taught modules over the first two semesters of the year, and a research project in the third semester. During each of the first two semesters, three of your four taught modules are compulsory, and the fourth is an option to be chosen from courses within photonics. The compulsory courses cover a range of topics which are central to modern photonics technologies, including lasers, photonic materials, optical fibres, and a course on photonics laboratory techniques. The optional topics available include both photonics specific courses, and related technologies such as microfabrication and nanoscience. The project makes use of the world-class photonics laboratory and cleanroom resources of the ORC.

Assessment

Assessment is through a mixture of laboratory sessions, coursework, and written examinations. Your research project enables you to explore in depth some aspect of photonics technologies.

Educational Aims of the Programme

The aims of the programme are to:

1. Provide you with advanced knowledge of Photonic Technologies.
2. Give you the opportunity to work in a research-led environment using state of the art facilities.
3. Develop your research skills applicable to a career in research and development.
4. Stimulate your interest in the subject using a variety of teaching and learning methods

Programme Learning Outcomes

Knowledge and Understanding

Having successfully completed this programme you will be able to demonstrate knowledge and understanding of:

A1. Scientific and technological principles underlying Photonic Technologies.
A2. Specialist tools and techniques used to design, construct measure and analyse Photonic Technologies.
A3. Current research issues relevant to Photonic Technologies.

Teaching and Learning Methods

You will have a variety of opportunities to achieve these learning outcomes. Learning and teaching methods include:
- Staff-led lectures, demonstrations, and seminars.
- Directed reading.
- Student-led seminars and presentations.
- Technical reports, including literature searches and surveys.
- Specification, design, analysis, implementation and verification exercises.
- Group design exercises, presentations and reports.
- Revision for written examinations.
- Staff and post-graduate supervision of your research project.

Assessment methods

Your achievement is assessed as follows. In the case of staff-led lectures and seminars, your knowledge and understanding (outcomes A1-3) is assessed through written examinations and technical reports. Your understanding of research issues and your ability to locate and present technical information (outcome C) is assessed through student-led presentations, technical reports and written examinations, and additionally your dissertation. The research project (outcome A3) is assessed through your dissertation, which must include a significant literature survey to set the context for your work, a review of your progress relative to your initial plan, and a critical evaluation and reflection.

Subject Specific Intellectual and Research Skills

Having successfully completed this programme you will be able to:

B1. Use specialist tools and techniques to design, construct, measure and analyse Photonic Technologies.
B2. Model, simulate and analyse the behaviour of (sub-) systems at an appropriate level of detail.
B3. Acquire new knowledge and understanding through critical reading of research material.
B4. Apply such knowledge and understanding to specialist design problems.

Teaching and Learning Methods

- Staff-led lectures, demonstrations, and seminars.
- Directed reading.
- Student-led seminars and presentations.
- Technical reports, including literature searches and surveys.
- Specification, design, analysis, implementation and verification exercises.

- Group design exercises, presentations and reports.
- Revision for written examinations.
- Staff and post-graduate supervision of your research project.

Assessment methods

Your achievement is assessed as follows. Your understanding of research issues and your ability to locate and present technical information (outcome B3) is assessed through student-led presentations, technical reports and written examinations, and additionally your dissertation. Your ability to design and implement photonic systems, perhaps using novel technologies, (outcomes B1, B2, B4) is developed through design exercises, and additionally your research project, and assessed through technical reports and your dissertation. These reports are expected to include a rationale for your design and implementation decisions and evidence of verification activities. The research project (outcomes B3, B4) is assessed through your dissertation, which must include a significant literature survey to set the context for your work, a review of your progress relative to your initial plan, and a critical evaluation and reflection.

Transferable and Generic Skills

Having successfully completed this programme you will be able to:

C1. Use printed and on-line catalogues and databases to locate relevant technical information.
C2. Present specialist technical information in written and verbal forms.
C3. Work efficiently and effectively as a member of a project team.
C4. Work independently on a significant research project.

Teaching and Learning Methods

- Directed reading.
- Student-led seminars and presentations.
- Technical reports, including literature searches and surveys.
- Specification, design, analysis, implementation and verification exercises.
- Group design exercises, presentations and reports.
- Staff and post-graduate supervision of your research project.

Assessment methods

Your achievement is assessed as follows. Your understanding of research issues, and your ability to locate and present technical information (outcomes C1, C2) is assessed through student-led presentations, technical reports and written examinations, and additionally your dissertation. Students are expected to maintain log-books that demonstrate their contribution to group projects (outcome C3), and these may also be assessed. The research project (outcomes C1, C2, C4) is assessed through your dissertation, which must include a significant literature survey to set the context for your work, a review of your progress relative to your initial plan, and a critical evaluation and reflection.

Subject Specific Practical Skills

Having successfully completed this programme you will be able to:

D1.   Work competently with lasers and optics to gather experimental data.
D2.   Be familiar with a range of laser sources, optics, and detectors.
D3.   Process, analyse, and display data from optical experiments
D4.   Align optical systems using standard techniques.
D5.   Be familiar with optical clean room technologies and techniques.

Programme Structure

Typical course content

The program consists of eight taught modules over the first two semesters of the year, and a research project in the third semester. During each of the first two semesters, three of your four taught modules are compulsory,

and the fourth is an option to be chosen from courses within photonics. The compulsory courses cover a range of topics which are central to modern photonics technologies, including lasers, photonic materials, optical fibres, and a course on photonics laboratory techniques. The optional topics available include both photonics specific courses, and related technologies such as microfabrication and nanoscience. The project makes use of the world-class photonics laboratory and cleanroom resources of the ORC.

Special Features of the programme
A further feature of the programme is a 1-week industrial showcase, where specialist companies will provide information about employment opportunities, and you have the opportunity to put together a presentation on the photonics market, product development and sales opportunities.

Programme details
The programme has a number of compulsory and optional taught modules. Each successfully completed module is worth 7.5 ECTS credits. The MSc requires you to complete 60 ECTS credits of taught modules. You then undertake a research project leading to a dissertation worth a further 30 ECTS credits
The normal pattern of study is as follows:

Semester 1: Three compulsory modules covering lasers, optical fibres, and nanophotonics. Assessment is through a mixture of coursework and written examinations. There are also three optional modules available in photonics and related topics.
Semester 2: There are three compulsory modules providing deeper understanding of solid state and ultrafast lasers and photonic materials, together with a specialist photonics laboratory course. These modules are assessed through laboratory sessions, coursework and written examinations. There are also three optional modules available in photonics and related topics.
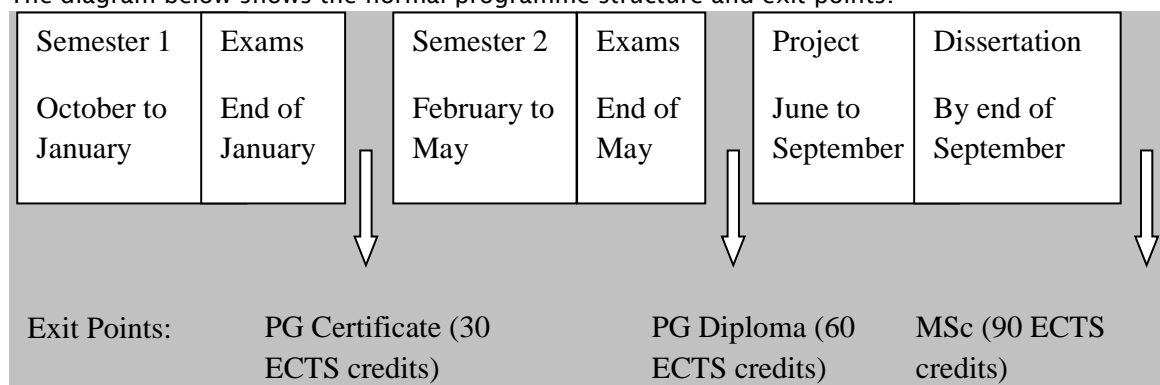Summer/Semester 3: Following the successful completion of the taught component of the programme, you will undertake a research project lasting around 17 weeks, involving cleanroom and optical lab work. The project can optionally contain a strong industrial component. It is assessed by a 15,000 word dissertation, and a presentation in a student conference.

Examinations are held at the end of Semester 1 (January) and at the end of Semester 2 (May).

Your research project will enable you to explore in depth some aspect of photonic technologies. The project builds on the taught courses and hands-on practical sessions from semester 1 and 2. It provides training in methodology, techniques and skills essential for carrying out independent research and development tasks. During semester 2, you will be allocated a project supervisor with whom you will meet and agree a project brief and plan. These must submitted to, and agreed by, the project coordinator. During the summer you will have weekly meetings with your supervisor or, if your supervisor is unavailable, a delegated deputy. Your dissertation is due by the end of September and late submissions will be penalised, unless an extension to this deadline has been agreed beforehand in writing by the project coordinator.

Students who have successfully completed 30 or 60 ECTS credits worth of taught material may exit with a Postgraduate Certificate or Postgraduate Diploma respectively.

The diagram below shows the normal programme structure and exit points.

Semester 1	Exams	Semester 2	Exams	Project	Dissertation
October to January	End of January	February to May	End of May	June to September	By end of September

Exit Points:	PG Certificate (30 ECTS credits)	PG Diploma (60 ECTS credits)	MSc (90 ECTS credits)

Additional Costs

Students are responsible for meeting the cost of essential textbooks, and of producing such essays, assignments, laboratory reports and dissertations as are required to fulfil the academic requirements for each programme of study. Costs that students registered for this programme typically also have to pay for are included in Appendix 2:

Progression Requirements

The programme follows the University's regulations for _**Progression, Determination and Classification of Results: Standalone Masters Programmes**_ as set out in the University Calendar [http://www.calendar.soton.ac.uk/sectionIV/progression-regs-standalonemasters.html]

Intermediate exit points (where available)

You will be eligible for an interim exit award if you complete part of the programme but not all of it, as follows:

Qualification	Minimum overall credit in ECTS credits	Minimum ECTS credits required at level of award
Postgraduate Diploma	at least 60	45
Postgraduate Certificate	at least 30	20

Support for student learning

There are facilities and services to support your learning some of which are accessible to students across the University and some of which will be geared more particularly to students in your particular Faculty or discipline area.

The University provides:

- library resources, including e-books, on-line journals and databases, which are comprehensive and up-to-date; together with assistance from Library staff to enable you to make the best use of these resources
- high speed access to online electronic learning resources on the Internet from dedicated PC Workstations onsite and from your own devices; laptops, smartphones and tablet PCs via the Eduroam wireless network. There is a wide range of application software available from the Student Public Workstations.
- computer accounts which will connect you to a number of learning technologies for example, the Blackboard virtual learning environment (which facilitates online learning and access to specific learning resources)
- standard ICT tools such as Email, secure filestore and calendars.
- access to key information through the MySouthampton Student Mobile Portal which delivers timetables, Module information, Locations, Tutor details, Library account, bus timetables etc. while you are on the move.
- IT support through a comprehensive website, telephone and online ticketed support and a dedicated helpdesk in the Student Services Centre
- Enabling Services offering assessment and support (including specialist IT support) facilities if you have a disability, dyslexia, mental health issue or specific learning difficulties
- the Student Services Centre (SSC) to assist you with a range of general enquiries including financial matters, accommodation, exams, graduation, student visas, ID cards
- Career Destinations, advising on job search, applications, interviews, paid work, volunteering and internship opportunities and getting the most out of your extra-curricular activities alongside your degree programme when writing your CV
- a range of personal support services : mentoring, counselling, residence support service, chaplaincy, health service
- a Centre for Language Study, providing assistance in the development of English language and study skills for non-native speakers.

The Students' Union provides

- an academic student representation system, consisting of Course Representatives, Academic Presidents, Faculty Officers and the Vice-President Education; SUSU provides training and support for all these representatives, whose role is to represent students' views to the University.
- opportunities for extracurricular activities and volunteering
- an Advice Centre offering free and confidential advice including support if you need to make an academic appeal
- Support for student peer-to-peer groups, such as Nightline.

Associated with your programme you will be able to access:
- Tutorials - you will have a personal tutor whom you can meet on request for advice on your programme and choice of options, or for pastoral support
- A mentor (usually a postgraduate student who has previously taken the course) that sees you weekly
- Laser labs, and optical fibre clean room, and other research facilities, with a range of manuals
- A web site for each taught module, typically with teaching materials

Methods for evaluating the quality of teaching and learning

You will have the opportunity to have your say on the quality of the programme in the following ways:

- Completing student evaluation questionnaires for each module of the programme
- Acting as a student representative on various committees, e.g. Staff: Student Liaison Committees, Faculty Programmes Committee OR providing comments to your student representative to feed back on your behalf.
- Serving as a student representative on Faculty Scrutiny Groups for programme validation
- Taking part in programme validation meetings by joining a panel of students to meet with the Faculty Scrutiny Group

The ways in which the quality of your programme is checked, both inside and outside the University, are:

- Regular module and programme reports which are monitored by the Faculty
- Programme validation, normally every five years.
- External examiners, who produce an annual report
- A national Research Excellence Framework (our research activity contributes directly to the quality of your learning experience)
- Higher Education Review by the Quality Assurance Agency

Criteria for admission

The University's Admissions Policy applies equally to all programmes of study. The following are the typical entry criteria to be used for selecting candidates for admission. The University's approved equivalencies for the requirements listed below will also be acceptable.

Undergraduate programmes

Qualification	Grades	Subjects required	Subjects not accepted	EPQ Alternative offer (if applicable)	Contextual Alternative offer (if applicable)
GCE A level					
GCSE					
BTEC					
International Baccalaureate					
European Baccalaureate					

Postgraduate programmes

Qualification	Grade/GPA	Subjects requirements	Specific requirements
Bachelor's degree	2.1 Honours		
Master's degree			

Mature applicants
Applications from mature students (over 21 years in the October of the year of entry) are welcome. Applications will be considered on an individual basis.

English Language Proficiency

Overall	Reading	Writing	Speaking	Listening
6.5	6.0	6.0	6.0	6.0

Career Opportunities

In completing an MSc at the ORC, you will work alongside some of the world's leading photonics scientists, and spend time conducting novel research in our state-of-the-art facilities, keeping up to date with current research trends in photonics. Our students receive a solid grounding for their future careers in photonics; over 600 ORC alumni work in strategic positions in the Photonics industry worldwide. MSc students are ideally suited to continuing in research PhD studies, or moving directly into the growing photonics industry, which you will experience during the Industrial Showcase as part of your MSc training.

External Examiners(s) for the programme

Name Professor John Donegan
Institution. Trinity College Dublin

Students must not contact External Examiner(s) directly, and external examiners have been advised to refer any such communications back to the University. Students should raise any general queries about the assessment and examination process for the programme with their Course Representative, for consideration through Staff:

Student Liaison Committee in the first instance, and Student representatives on Staff: Student Liaison Committees will have the opportunity to consider external examiners' reports as part of the University's quality assurance process.

External examiners do not have a direct role in determining results for individual students, and students wishing to discuss their own performance in assessment should contact their personal tutor in the first instance.

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 s/he takes full advantage of the learning opportunities that are provided. More detailed information can be found in the programme handbook (or other appropriate guide) or online at http://www.orc.soton.ac.uk/mscprogramme.html

Appendix 1:

Learning outcomes and Assessment Mapping document template

Module Code	Module Title	Knowledge and Understanding			Subject Specific Intellectual Skills				Transferable/Key Skills				Subject specific practical skills				
		A1	A2	A3	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4	D5
PHYS6024	Lasers	x	x	x		x	x		x	x							
OPTO6008	Optical Fibre Technology 1	x	x	x		x	x			x							
OPTO6004	Plasmonics, Metamaterials, and nanophotonics	x	x	x	x	x	x		x	x							
PHYS3003	Light and Matter	x		x	x		x			x							
OPTO6007	Silicon Photonics	x	x	x	x	x	x	x		x							
ELEC6201	Microfabrication	x	x						x	x							
OPTO6002	Solid State and Ultrafast lasers	x	xx	x					x	x							
OPTO6003	Photonic Materials	x	x	x					x	x							
OPTO6023	Photonics laboratory	x	x		x	x		x	x	x			x	x	x	x	
OPTO6013	Industrial Dissertation	x	x	x		x	x	x		x		x					
PHYS6014	Nanoscience	x		x		x	x		x	x							
ELEC6208	MEMs sensors and actuators	x	x	x		x	x		x	x							

| OPTO6012 | Project | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| OPTO6014 | Industrial Project | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

Module Code	Module Title	Assessment 1		Assessment 2		Assessment 3
PHYS6024	Lasers					Exam, 2 hours. **100%**
OPTO6023	Photonics Laboratory	Lab work 88%				Conference Presentation 12%
PHYS3003	Light & Matter					Exam, 2 hours, 100%
OPTO6002	Solid State and Ultrafast lasers	problem sheets (solid state lasers) – 15%		problem sheets (Ultrafast lasers) – 15%		Exam, 2.5 hours, 70%
OPTO6003	Photonic Materials	3 x Assignments – 30%				Exam, 2.5 hours, 70%
OPTO6004	Plasmonics, Metamaterials, and Nanophotonics	Problem classes – 20%				Exam, 2.5 hours, 80%
OPTO6007	Silicon Photonics	2 work sheets 25%				Exam, 2 hours, 75%
OPTO6008	Introduction to Optical Fibres 1	Problem sheets – 20%				Exam, 2.5 hours, 80%
OPTO6013	Industrial Dissertation	Executive summary 20%		Presentation 25%		Dissertation 55%
PHYS6014	Nanoscience					Exam, 2 hours, 100%
OPTO6012	Project	Project dissertation – 55%	Project presentation – 18%	Mid-project report - 18%		Industrial showcase assignment – 9%
OPTO6014	Industrial Project	Dissertation - 50%	Mid-term report – 16%	Presentation – 16%	Industrial showcase assignment – 8%	Industrial review 10%
ELEC6201	Microfabrication	Microfabrication Assignment – 30%		Exam, 2 hours. **70%**		
ELEC6208	MEMS sensors & actuators	Design study 1 – 25%	Design study 2 – 25 %	Design study 3 – 25%		Design study 4 – 25%

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Revision History
1. Minor revisions (including title) 10 July 2007 (SCK
2. New Brand added July 2008
3. Updated to reflect University restructuring June 2011 AB.
4. Revisions approved by Senate 19 June 2013 as part of new programme validation process
5. Minor changes made to form guidance on completion of Intended Learning Outcomes, and Learning outcomes and Assessment Mapping document template, for clarity; and changes to wording of support for student learning section, altering to second person throughout – agreed with the Chair and to be reported to UPC October 2013
6. Updated to new template - October 2014
7. 27/11/14 Updates after comments from FPC; module assessment details updated, typographical errors corrected.
8. 17/6/2015: Changed Project module code, updated marking shemes to reflect addition of Industrial showcase to project. Added OPTO6008 as first semester option. Changed ELEC6108 for ELEC6201, and ELEC6133 for ELEC6208 in line with ECS changes
9. 17/8/2015: Changed "Part 1", "Part 2","Part 3" to "Semester 1", "Semester 2, "Summer"
10. Update to Programme Overview (CMA Changes) – 24 August 2015
11. Update to Programme Overview (CMA Changes) – 08 September 2015
    Moved to new template, added industrial modules, updated program structure – wsb, 05/02/2016

12. Reformatted assessment template to make sure all assessment information is correct after checking against versions on syllabus.soton – 18th August 16
13. Switched semesters for OPTO6004 and PHYS6023, in line with ORC Education Committee decision. Changed course code from PHYS6023 to OPTO6023
14. 14 Changed year to 17-18. Checked changes in course code for OPTO6023.
15. 30/03/2017 - FPC approval (08/03) for 2017/18 (CQA Team)

MSc Photonic

Technologies Structure

Semester 1
Compulsory
PHYS6024
OPTO6008
OPTO6004

Optional from within Faculty
OPTO6007
PHYS3003
ELEC6201

PG certificate

Semester 2
Compulsory
OPTO6002
OPTO6003
OPTO6023

Optional from within Faculty
OPTO6013 Industrial Dissertation
ELEC6208
PHYS6014

PG diploma

Summer
Core- one of:
OPTO6012 Project
OPTO6014 Industrial Project

MSc
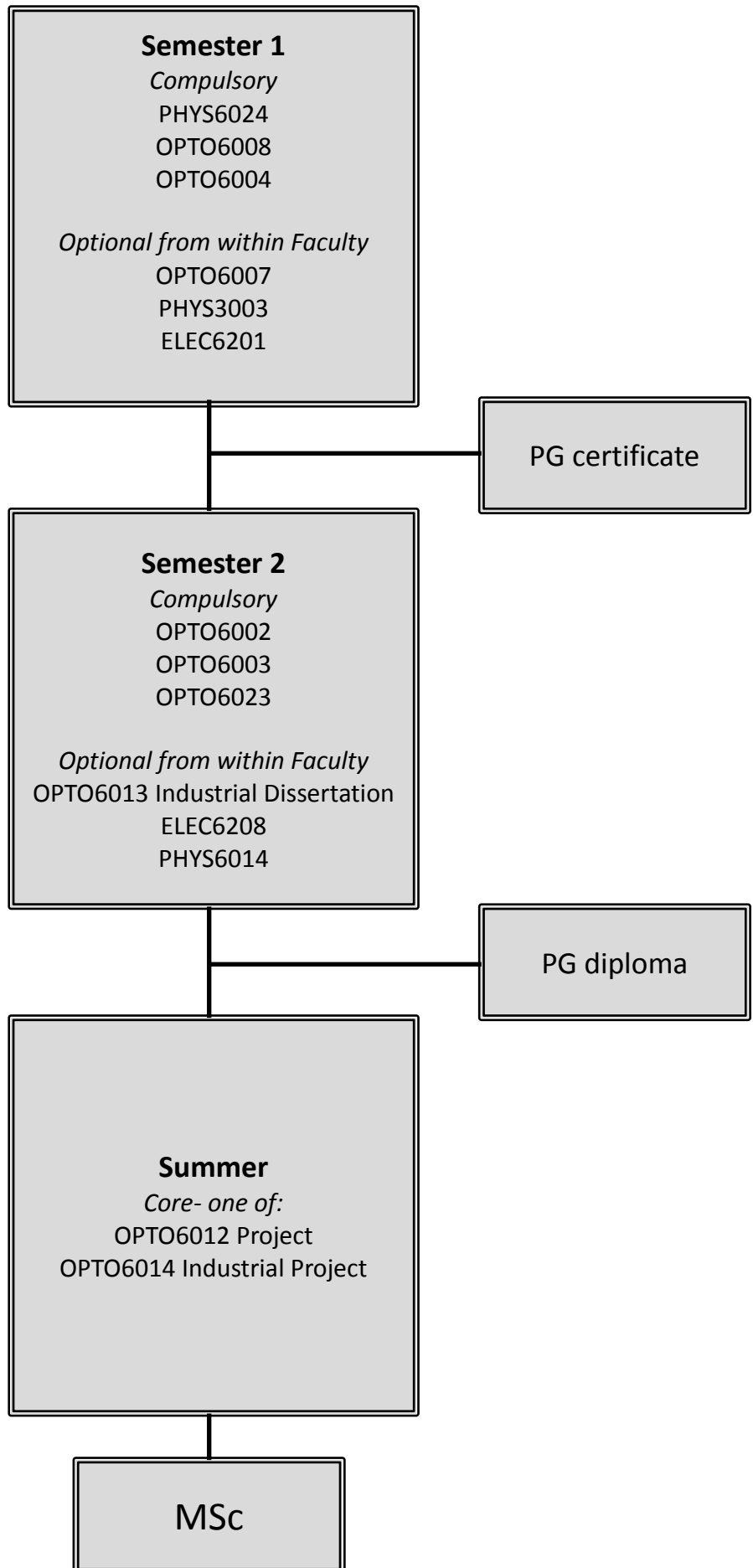
Appendix 2:

Additional Costs

Students are responsible for meeting the cost of essential textbooks, and of producing such essays, assignments, laboratory reports and dissertations as are required to fulfil the academic requirements for each programme of study. In addition to this, students registered for this programme typically also have to pay for the items listed in the table below.

In some cases you'll be able to choose modules (which may have different costs associated with that module) which will change the overall cost of a programme to you. Details of such costs will be listed in the Module Profile. Please also ensure you read the section on additional costs in the University's Fees, Charges and Expenses Regulations in the University Calendar available at www.calendar.soton.ac.uk.

Main Item	Sub-section	PROGRAMME SPECIFIC COSTS
Approved Calculators		Candidates may use calculators in the examination room only as specified by the University and as permitted by the rubric of individual examination papers. The University approved models are Casio FX-570 and Casio FX-85GT Plus. These may be purchased from any source and no longer need to carry the University logo.
Stationery		You will be expected to provide your own day-to-day stationary items, e.g. pens, pencils, notebooks, etc). Any specialist stationery items will be specified under the Additional Costs tab of the relevant module profile.
T**extbooks**		Where a module specifies core texts these should generally be available on the reserve list in the library. However due to demand, students may prefer to buy their own copies. These can be purchased from any source. Some modules suggest reading texts as **optional** background reading. The library may hold copies of such texts, or alternatively you may wish to purchase your own copies. Although not essential reading, you may benefit from the additional reading materials for the module.
Equipment and Materials Equipment	Art Equipment and Materials: Drawing paper; painting materials; sketchbooks	
	Art Equipment and Materials: Fabric, Thread, Wool	
	Design equipment and materials:	
	Excavation equipment and materials:	
	Field Equipment and Materials:	
	Laboratory Equipment and Materials:	
	Medical Equipment and Materials: Fobwatch;	

Main Item	Sub-section	PROGRAMME SPECIFIC COSTS
	stethoscopes;	
	Music Equipment and Materials	
	Photography:	
	Recording Equipment:	
IT	Computer Discs	
	Software Licenses	
	Hardware	
Clothing	Lab Coats	
	Protective Clothing: Hard hat; safety boots; hi-viz vest/jackets;	
	Fieldcourse clothing:	
	Wet Suits?	
	Uniforms?	
Printing and Photocopying Costs		n the majority of cases, coursework such as essays; projects; dissertations is likely to be submitted on line. However, there are some items where it is not possible to submit on line and students will be asked to provide a printed copy. A list of the University printing costs can be found here: [insert link to relevant page].
Fieldwork: logistical costs	Accommodation:	
	Insurance	
	Travel costs	
	Immunisation/vaccination costs	
	Other:	
Placements (including Study Abroad Programmes)	Accommodation	
	Insurance	
	Medical Insurance	
	Travel costs	
	Immunisation/vaccination costs	
	Disclosure and Barring Certificates or Clearance	
	Translation of birth certificates	
	Other	
Conference expenses	Accommodation	
	Travel	
Optional Visits (e.g. museums, galleries)		
Professional Exams		
Parking Costs		
Anything else not covered elsewhere		