Programme Specification

MSc Photonic Technologies (2018-19)

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.

<table>
<thead>
<tr>
<th>Awarding Institution</th>
<th>University of Southampton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching Institution</td>
<td>University of Southampton</td>
</tr>
<tr>
<td>Mode of Study</td>
<td>Full-time</td>
</tr>
<tr>
<td>Duration in years</td>
<td>1</td>
</tr>
<tr>
<td>Accreditation details</td>
<td>None</td>
</tr>
<tr>
<td>Final award</td>
<td>Master of Science (MSc)</td>
</tr>
<tr>
<td>Name of award</td>
<td>Photonic Technologies</td>
</tr>
<tr>
<td>Interim Exit awards</td>
<td>Postgraduate Certificate in Higher Education</td>
</tr>
<tr>
<td></td>
<td>Postgraduate Diploma in Higher Education</td>
</tr>
</tbody>
</table>

| FHEQ level of final award | Level 7 |
| UCAS code                | N/A     |
| Programme code           | 5071    |
| QAA Subject Benchmark or other external reference | QAA Framework for Higher Education Qualifications (FHEQ) 2008 |
| Programme Lead           | William Brocklesby (wsb) |

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.

Your contact hours will vary depending on your module/option choices. Full information about contact hours is provided in individual module profiles.

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.

**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.

**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](#).

**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**

On successful completion of this programme you will have knowledge and understanding of:

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

On successful completion of 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.
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

On successful completion of 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

On successful completion of 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

The programme structure table is below:

Information about pre and co-requisites is included in individual module profiles.

Part I

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.

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.

It should be noted that it may not be possible to run some optional modules if the number of students registered on the module is very small. It should also be noted that optional module choice can be restricted by the University Timetable, which varies from year to year: some optional modules may clash with other optional or compulsory modules. Please be aware that many modules are shared between different cohorts; the class size depends on cohort size, which varies from year to year.

### Part I Compulsory

<table>
<thead>
<tr>
<th>Code</th>
<th>Module Title</th>
<th>ECTS</th>
<th>Type</th>
</tr>
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<tbody>
<tr>
<td>OPTO6002</td>
<td>Advanced Lasers</td>
<td>7.5</td>
<td>Compulsory</td>
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<tr>
<td>PHYS6024</td>
<td>Lasers</td>
<td>7.5</td>
<td>Compulsory</td>
</tr>
<tr>
<td>OPTO6004</td>
<td>Metamaterials, Nanophotonics and Plasmonics</td>
<td>7.5</td>
<td>Compulsory</td>
</tr>
<tr>
<td>OPTO6008</td>
<td>Optical Fibres</td>
<td>7.5</td>
<td>Compulsory</td>
</tr>
<tr>
<td>OPTO6003</td>
<td>Photonic Materials</td>
<td>7.5</td>
<td>Compulsory</td>
</tr>
<tr>
<td>OPTO6023</td>
<td>Photonics Laboratory and Study Skills</td>
<td>7.5</td>
<td>Compulsory</td>
</tr>
</tbody>
</table>

### Part I Optional

<table>
<thead>
<tr>
<th>Code</th>
<th>Module Title</th>
<th>ECTS</th>
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<tbody>
<tr>
<td></td>
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<tr>
<td>Code</td>
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</tr>
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<tr>
<td>OPTO6014</td>
<td>Industrial Project (R&amp;D Project)</td>
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<tr>
<td>OPTO6012</td>
<td>Project</td>
<td>30</td>
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### Part I Optional Core
Students should select one of the following:

<table>
<thead>
<tr>
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<th>ECTS</th>
<th>Type</th>
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</thead>
<tbody>
<tr>
<td>ELEC6208</td>
<td>Bio/Micro/Nano Systems</td>
<td>7.5</td>
<td>Optional</td>
</tr>
<tr>
<td>OPTO6013</td>
<td>Industrial Dissertation (R&amp;D Dissertation)</td>
<td>7.5</td>
<td>Optional</td>
</tr>
<tr>
<td>PHYS3003</td>
<td>Light and Matter</td>
<td>7.5</td>
<td>Optional</td>
</tr>
<tr>
<td>ELEC6201</td>
<td>Microfabrication</td>
<td>7.5</td>
<td>Optional</td>
</tr>
<tr>
<td>PHYS6014</td>
<td>Nanoscience: technology and advanced materials</td>
<td>7.5</td>
<td>Optional</td>
</tr>
<tr>
<td>OPTO6007</td>
<td>An Introduction to Silicon Photonics</td>
<td>7.5</td>
<td>Optional</td>
</tr>
<tr>
<td>ELEC6208</td>
<td>Bio/Micro/Nano Systems</td>
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<td>Optional</td>
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<td>PHYS6014</td>
<td>Nanoscience: technology and advanced materials</td>
<td>7.5</td>
<td>Optional</td>
</tr>
</tbody>
</table>

### Progression Requirements
The programme will follow the University's regulations for *Progression, Determination and Classification of Results: Undergraduate and Integrated Masters Programmes* or the University's regulations for *Progression, Determination and Classification of Results: Standalone Masters Programmes* as set out in the General Academic Regulations in the University Calendar: [http://www.calendar.soton.ac.uk/sectionIV/sectIV-index.html](http://www.calendar.soton.ac.uk/sectionIV/sectIV-index.html)

### 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 Hartley Library.
• Enabling Services offering support services and resources via a triage model to access crisis management, mental health support and counselling. Support includes daily Drop In at Highfield campus at 13.00 – 15.00 (Monday, Wednesday and Friday out of term-time) or via on-line chat on weekdays from 14.00 – 16.00. Arrangements can also be made for meetings via Skype.
• assessment and support (including specialist IT support) facilities if you have a disability, long term health problem or Specific Learning Difficulty (e.g. dyslexia).
• 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 and Employability services, 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
• Other support that includes health services (GPs), chaplaincy (for all faiths) and 'out of hours' support for students in Halls and in the local community, (18.00-08.00)
• 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

Further details on the University's quality assurance processes are given in the Quality Handbook.

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 Examiner(s) for the programme**

Name: Professor John Donegan - 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 Academic 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.
Appendix 1:

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 also have to pay for:

Additional Costs

<table>
<thead>
<tr>
<th>Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stationery</td>
<td>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.</td>
</tr>
<tr>
<td>Textbooks</td>
<td>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.</td>
</tr>
<tr>
<td>Approved Calculators</td>
<td>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.</td>
</tr>
<tr>
<td>Printing and Photocopying Costs</td>
<td>In 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].</td>
</tr>
</tbody>
</table>

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.