Programme Specification
Undergraduate

Applicable to all non-clinical undergraduate programmes*

Please click here for guidance on completing this specification template.

*Excluding Integrated Master’s degrees.

### Part A: Programme Summary Information

1. **Title of programme:** Physics
2. **Programme Code:** F300 (BSc)
3. **Entry Award:**
   - ☑ BA (Hons)
   - ☒ BSc (Hons) 360 with at least 90 at FHEQ level 6 or above.
   - ☑ Other (please specify below): 360 with at least 90 at FHEQ level 6 or above.

   F308 Physical Sciences

4. **Exit Awards:**
   - ☑ Diploma in Higher Education (Dip HE) 240 with at least 90 at FHEQ level 5 or above.
   - ☑ Certificate in Higher Education (Cert HE) 120 with at least 90 at FHEQ level 4 or above.

5. **Date of first intake:** -
6. **Frequency of intake:** Annually in September
7. **Duration and mode of study:** Full-time, 3 Years (BSc)
8. **Applicable framework:** Model for Non-Clinical First Degree Programmes
   - **Framework exemption required:** ☑ No (please go to section 9)
   - ☐ Yes (please provide a brief summary below)
9. Applicable Ordinance: General Ordinance for Undergraduate Degrees

New/revised Ordinance required:
☐ No (please go to section 10)
☐ Yes (please provide a brief summary below)

Date new/revised Ordinance approved by Council:

10. Faculty: Faculty of Science & Engineering

11. Level 2 School/Institute: School of Physical Sciences

12. Level 1 unit: Department of Physics

13. Campus: Main University of Liverpool Campus

14. Other contributors from UoL: Astrophysics Research Institute, Liverpool John Moores University

15. Teaching other than at UoL: Astrophysics Research Institute, Liverpool John Moores University

16. Director of Studies: Professor C A Lucas

17. Board of Studies: Board of Studies in Physics

18. Board of Examiners: Board of Examiners in Physics

19. External Examiner(s):
   Name: Prof J Inglesfield
   Institution: Cardiff University
   Position:


21. QAA Subject benchmark Statements(s):
   Physics and Astronomy

22. Other reference points: QAA Code of Practice

23. Fees: Standard UoL fees for B.Sc. (Hons.) programme

24. Additional costs to the student: None.

25. AQSC approval:
26. **Aims of the Programme**

The aim of the programme is to produce graduates who will be eligible for careers open to general physics graduates.

<table>
<thead>
<tr>
<th>No.</th>
<th>Aim:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To provide an understanding of physics at a depth appropriate for those aiming for a professional career in the subject</td>
</tr>
<tr>
<td>2</td>
<td>To use the Department’s involvement in first-class international scientific research, both to enrich the teaching and to inform programme design</td>
</tr>
<tr>
<td>3</td>
<td>To encourage each student’s learning, understanding and application of the knowledge taught</td>
</tr>
<tr>
<td>4</td>
<td>To develop each student’s mathematical and analytical skills</td>
</tr>
<tr>
<td>5</td>
<td>To develop each student’s competence in Scientific communication, both in oral and written form</td>
</tr>
</tbody>
</table>

27. **Learning Outcomes**

**No. Learning outcomes – Bachelor’s Honour’s degree**

<table>
<thead>
<tr>
<th>QAA</th>
<th>Bachelor’s degree with Honours (BSc)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The subject-based aims above are addressed by a programme design that facilitates a wide-ranging set of learning outcomes embracing knowledge and understanding, intellectual skills and practical skills. The subject-based intended learning outcomes that should be attained by a successful student are:</td>
</tr>
<tr>
<td>6.5.1</td>
<td>a knowledge and understanding of most fundamental physical laws and principles, and competence in the application of these principles to diverse areas of physics</td>
</tr>
<tr>
<td>6.5.2</td>
<td>an ability to solve problems in physics using appropriate mathematical tools. Students should be able to identify the relevant physical principles and make approximations necessary to obtain solutions</td>
</tr>
<tr>
<td>6.5.3</td>
<td>the ability to execute and analyse critically the results of an experiment or investigation and draw valid conclusions. Students should be able to evaluate the level of uncertainty in their results and compare these results with expected outcomes, theoretical predictions or with published data. They should be able to evaluate the significance of their results in this context.</td>
</tr>
<tr>
<td>6.5.4</td>
<td>a sound familiarity with laboratory apparatus and techniques if on experimental programmes</td>
</tr>
<tr>
<td>6.5.5</td>
<td>effective use of appropriate ICT packages/systems for the analysis of data and the retrieval of appropriate information</td>
</tr>
<tr>
<td>6.5.6</td>
<td>An ability in numerical manipulation and the ability to present and interpret information graphically</td>
</tr>
<tr>
<td>6.5.7</td>
<td>An ability to use mathematical techniques and analysis to model physical behaviour</td>
</tr>
<tr>
<td>6.5.8</td>
<td>An ability to communicate scientific information. In particular, students should be able to produce clear and accurate scientific reports</td>
</tr>
<tr>
<td>6.5.9</td>
<td>An ability to manage their own learning and to make use of appropriate texts, research-based materials or other learning resources</td>
</tr>
<tr>
<td>No.</td>
<td>Learning outcomes – Bachelor’s Non-Honour’s degree</td>
</tr>
<tr>
<td>-----</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td><strong>QAA Bachelor’s Non-Honour’s degree</strong></td>
</tr>
<tr>
<td></td>
<td>A degree without honours may be awarded to a candidate who gains at least 300 credits of which at least 120 credits must be at a level equivalent to the first year of an honour’s degree (FHEQ level 4), at least 120 credits must be at a level equivalent to the second year of an honour’s degree (FHEQ level 5) and at least 60 credits must be at a level equivalent to the third year of an honour’s degree (FHEQ level 6).</td>
</tr>
<tr>
<td>6.5.1</td>
<td>a knowledge and understanding of most fundamental physical laws and principles, and competence in the application of these principles to a range of areas of physics</td>
</tr>
<tr>
<td>6.5.2</td>
<td>an ability to solve problems in physics using appropriate mathematical tools. Students should be able to identify the relevant physical principles and make approximations necessary to obtain solutions</td>
</tr>
<tr>
<td>6.5.3</td>
<td>the ability to execute and analyse critically the results of an experiment or investigation and draw valid conclusions. Students should be able to evaluate the level of uncertainty in their results and compare these results with expected outcomes, theoretical predictions or with published data. They should be able to evaluate the significance of their results in this context.</td>
</tr>
<tr>
<td>6.5.4</td>
<td>a familiarity with laboratory apparatus and techniques</td>
</tr>
<tr>
<td>6.5.5</td>
<td>use of appropriate ICT packages/systems for the analysis of data and the retrieval of appropriate information</td>
</tr>
<tr>
<td>6.5.6</td>
<td>an ability in numerical manipulation and the ability to present and interpret information graphically</td>
</tr>
<tr>
<td>6.5.7</td>
<td>an ability to use mathematical techniques and analysis to model physical behaviour</td>
</tr>
<tr>
<td>6.5.8</td>
<td>an ability to communicate scientific information.</td>
</tr>
<tr>
<td>6.5.9</td>
<td>an ability to manage their own learning and to make use of appropriate texts, research-based materials or other learning resources</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Learning outcomes – Diploma in Higher Education award</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>A Diploma in Higher Education may be awarded to a candidate who gains at least 240 credits of which at least 120 credits must be at a level equivalent to the second year of an honour’s degree (FHEQ level 5). Students completing Years 1 and 2 of the programme will have covered the core of physics specified by the Institute of Physics. This will provide them with basic knowledge, skills and understanding.</strong></td>
</tr>
<tr>
<td>6.5.1</td>
<td>a knowledge and understanding of most fundamental physical laws and principles, and competence in the application of these principles to a range of areas of physics</td>
</tr>
<tr>
<td>6.5.2</td>
<td>an ability to solve problems in physics using appropriate mathematical tools. Students should be able to identify the relevant physical principles and make approximations necessary to obtain solutions</td>
</tr>
<tr>
<td>6.5.3</td>
<td>the ability to execute and analyse critically the results of an experiment or investigation and draw valid conclusions</td>
</tr>
<tr>
<td>6.5.4</td>
<td>a familiarity with some laboratory apparatus and techniques</td>
</tr>
<tr>
<td>6.5.5</td>
<td>use of appropriate ICT packages/systems for the analysis of data and the retrieval of appropriate information</td>
</tr>
<tr>
<td>6.5.6</td>
<td>an ability in numerical manipulation and the ability to present and interpret information graphically</td>
</tr>
</tbody>
</table>
### Learning Outcomes

<table>
<thead>
<tr>
<th>No.</th>
<th>Learning outcomes – Certificate in Higher Education award</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A Certificate in Higher Education may be awarded to a candidate who gains at least 120 credits at a level equivalent to the first year of an honour’s degree (FHEQ level 4). Students completing Year 1 of the programme will have covered approximately half of the core of physics specified by the Institute of Physics. This will provide them with some basic knowledge, skills and understanding.</td>
</tr>
<tr>
<td>6.5.1</td>
<td>a knowledge and understanding of some fundamental physical laws and principles, and competence in the application of these principles to some areas of physics</td>
</tr>
<tr>
<td>6.5.2</td>
<td>an ability to solve problems in physics using appropriate mathematical tools</td>
</tr>
<tr>
<td>6.5.3</td>
<td>the ability to execute and analyse critically the results of an experiment or investigation and draw valid conclusions</td>
</tr>
<tr>
<td>6.5.4</td>
<td>a familiarity with some laboratory apparatus and techniques</td>
</tr>
<tr>
<td>6.5.5</td>
<td>use of appropriate ICT packages/systems for the analysis of data and the retrieval of appropriate information</td>
</tr>
<tr>
<td>6.5.6</td>
<td>an ability in numerical manipulation and the ability to present and interpret information graphically</td>
</tr>
<tr>
<td>6.5.7</td>
<td>an ability to use mathematical techniques and analysis to model physical behaviour</td>
</tr>
<tr>
<td>6.5.8</td>
<td>an ability to communicate scientific information</td>
</tr>
<tr>
<td>6.5.9</td>
<td>an ability to manage their own learning and to make use of appropriate texts or other learning resources</td>
</tr>
</tbody>
</table>

#### 27a. Mapping of learning outcomes:

<table>
<thead>
<tr>
<th>Learning outcome No.</th>
<th>Module(s) in which this will be delivered</th>
<th>Mode of assessing achievement of learning outcome</th>
<th>PSRB/Subject benchmark statement (if applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.5.1</td>
<td>101,102,103,104 201,202,203,204</td>
<td>Continuous assessment, written examination, problems set in workshops</td>
<td>Knowledge and understanding of most physical laws and principles</td>
</tr>
<tr>
<td>6.5.2</td>
<td>All FHEQ Level 4 &amp; 5 modules</td>
<td>Continuous assessment, written examination, problems set in workshops</td>
<td>Ability to solve problems in physics using appropriate mathematical tools</td>
</tr>
<tr>
<td>6.5.3</td>
<td>106, 206</td>
<td>Continuous assessment, written</td>
<td>Ability to execute and analyse critically results of</td>
</tr>
</tbody>
</table>
### 28. Skills and Other Attributes

<table>
<thead>
<tr>
<th>No.</th>
<th>Skills and attributes:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>QAA</strong></td>
</tr>
<tr>
<td>4.2.1</td>
<td>Ability to formulate and tackle problems in physics (i.e., identify the appropriate physical principles, use special and limiting cases and order-of-magnitude estimates, make assumptions and approximations explicit).</td>
</tr>
<tr>
<td>4.2.2</td>
<td>Ability to use mathematics to describe the physical world. They should have an understanding of mathematical modelling and of the role of approximation</td>
</tr>
<tr>
<td>4.2.3</td>
<td>Ability to plan, execute and report the results of an experiment or investigation. They should be able to use appropriate methods to analyse their data and to evaluate the level of its uncertainty. They should also be able to relate any conclusions they make to current theories of the physics involved.</td>
</tr>
</tbody>
</table>
4.3 Students should be able to compare critically the results of model calculations with those from experiment and observation.

**Generic Skills**

4.4.1 Problem-solving skills – physics degree programmes involve students in solving problems with well-defined solutions. They will also gain experience in tackling open-ended problems. Students should develop their ability to formulate problems in precise terms and to identify key issues. They should develop the confidence to try different approaches in order to make progress on challenging problems.

4.4.2 Investigative skills – students will have opportunities to develop their skills of Independent investigation. Students will generally have experience of using textbooks, and other available literature, of searching databases and the Internet, and of interacting with colleagues to derive important information.

4.4.3 Communication skills – physics and the mathematics used in physics deal with surprising ideas and difficult concepts; good communication is essential. A physics degree should develop a student's ability to listen carefully, to read demanding texts, and to present complex information in a clear and concise manner.

4.4.4 Analytical skills – physics helps students learn the need to pay attention to detail and to develop their ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.

4.4.5 ICT skills – during their studies, students will develop their computing and ICT skills in a variety of ways, including their ability to use appropriate software such as programming languages and packages.

4.4.6 Personal skills – students should develop their ability to work independently, to use their initiative and to organise themselves to meet deadlines. They should gain experience of group work and be able to interact constructively.

### 28a. Mapping of skills and other attributes:

<table>
<thead>
<tr>
<th>Skills and other attributes No.</th>
<th>Module(s) in which this will be delivered and assessed</th>
<th>Learning skills, research skills, employability skills</th>
<th>Mode of assessing achievement of the skill or other attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics Skill</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.2.1</td>
<td>105,115,135,165,106,107,108,205,265,206</td>
<td>How to formulate and tackle problems in physics</td>
<td>Continuous Assessment, Written examination, problems set in workshops, Projects,</td>
</tr>
<tr>
<td>4.2.2</td>
<td>107,108,207,208</td>
<td>Use of mathematics to describe physical world</td>
<td>Continuous Assessment, Written examination, problems set in workshops</td>
</tr>
<tr>
<td>4.2.3</td>
<td>106,206</td>
<td>Plan, execute and report results of an experiment</td>
<td>Continuous Assessment, Written examination, problems set in workshops, Oral</td>
</tr>
<tr>
<td>Section</td>
<td>Code</td>
<td>101,102,103,104, 105,115,135,165,106, 205,265,206</td>
<td>Assessment,  Continuous examination, problems set in workshops, Oral Presentation, Poster Presentation</td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
<td>-----------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>4.3</td>
<td>106,206</td>
<td>Comparison of model calculations with experiment</td>
<td>Continuous Assessment, Written examination, problems set in workshops, Oral Presentation, Poster Presentation, Journals</td>
</tr>
<tr>
<td><strong>Generic Skill</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.4.1</td>
<td>101,102,103,104</td>
<td>Problem-solving: Tackle open-ended problems</td>
<td>Continuous Assessment, Written examination, Class Tests, Oral Presentation, Poster Presentation</td>
</tr>
<tr>
<td>4.4.2</td>
<td>105,115,135,165,106, 206</td>
<td>Investigation: Use of information sources</td>
<td>Continuous Assessment, Written examination, problems set in workshops, Oral Presentation, Poster Presentation</td>
</tr>
<tr>
<td>4.4.3</td>
<td>101,102,103,104, 105,115,135,165,106</td>
<td>Communication: Read and present complex information</td>
<td>Continuous Assessment, Written examination, problems set in workshops, Oral Presentation, Poster Presentation</td>
</tr>
<tr>
<td>4.4.4</td>
<td>All FHEQ level 4 &amp; 5 modules</td>
<td>Analysis: Manipulate ideas, construct logical arguments</td>
<td>Continuous Assessment, Written examination, problems set in workshops, Oral Presentation, Poster Presentation</td>
</tr>
<tr>
<td>4.4.5</td>
<td>105,115,135,165,106, 205,265,206</td>
<td>ICT: Use of appropriate software packages and computer languages</td>
<td>Continuous Assessment, Written examination, problems set in workshops, Oral Presentation, Poster Presentation</td>
</tr>
<tr>
<td>4.4.6</td>
<td>All FHEQ level 4 modules</td>
<td>Personal: Organisation, time management, group work</td>
<td>Continuous Assessment, Written examination, problems set in workshops, Oral Presentation, Poster Presentation</td>
</tr>
</tbody>
</table>
29 Career opportunities:

Graduates of this programme will be eligible for an extremely wide range of career opportunities. Physics graduates are needed in industry where their training in the methodology of physics equips them for positions in engineering, management, marketing and administration in a wide variety of jobs with a strong technological bias.

There is a shortage of qualified physics teachers in schools, which is not being met by the available graduates.

Part C: Entrance Requirements

30 Academic Requirements:

The entry requirements are the same as for other Physics B.Sc. programmes, which are currently ABB at A level, including A levels in both physics and mathematics. Applications are encouraged from students with other suitable qualifications, such as GNVQs, International Baccalaureate, Scottish Highers, Irish Leaving Certificate and kite-marked Access to Higher Education courses. There is also a foundation level science programme for students with either poor A level grades, or A levels in non-science subjects (UCAS code F308). They are run for the University by an associated college, and successful completion will allow entry. For all students, evidence of a sufficiently strong background in science, equivalent to A level standard will be sought. Mature applicants are welcome and will normally be expected to show evidence of recent academic study, such as an appropriate Access course.

All candidates receiving an offer will be invited to visit the University to see the facilities and to find out more about the programme.

English Language is required at GCSE level grade C or equivalent. All international students applying to the University of Liverpool require a good level of spoken and written English.

31 Work experience:

None

32 Other requirements:

None

Part D: Programme Structure

33 Programme Structure:

All material required for IOP accreditation is covered in Years 1 and 2.
Year 3

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Credits</th>
<th>Level</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS306</td>
<td>Practical Physics III</td>
<td>15</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>PHYS361</td>
<td>Quantum Mechanics and Atomic Physics</td>
<td>15</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>PHYS370</td>
<td>Advanced Electromagnetism</td>
<td>15</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>15 credits selected from:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS379</td>
<td>Project (BSc)</td>
<td>15</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>PHYS395</td>
<td>Group Physics Project</td>
<td>15</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>PHYS396</td>
<td>Undergraduate Ambassadors Project</td>
<td>15</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>30 credits selected from:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS351</td>
<td>Stellar Astrophysics</td>
<td>15</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>PHYS355</td>
<td>Planetary Physics</td>
<td>7.5</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>PHYS375</td>
<td>Nuclear Physics</td>
<td>7.5</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>PHYS381</td>
<td>Surface Physics</td>
<td>7.5</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>PHYS387</td>
<td>Materials Physics</td>
<td>7.5</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>PHYS389</td>
<td>Semiconductor Applications</td>
<td>7.5</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>
Programme Specification UG

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>ECTS</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS391</td>
<td>Communicating Science</td>
<td>7.5</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>PHYS393</td>
<td>Statistical and Low Temperature Physics</td>
<td>15</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td><strong>120</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

+ 30 credits selected from:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>ECTS</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS246</td>
<td>Accelerators and Radioisotopes in Medicine</td>
<td>15</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>PHYS363</td>
<td>Condensed Matter Physics</td>
<td>7.5</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>PHYS374</td>
<td>Relativity and Cosmology</td>
<td>15</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>PHYS377</td>
<td>Particle Physics</td>
<td>7.5</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>PHYS382</td>
<td>Physics of Life</td>
<td>7.5</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>PHYS388</td>
<td>Physics of Energy Sources</td>
<td>15</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>PHYS397</td>
<td>Technology Transfer and Commercialisation</td>
<td>7.5</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

34. **Industrial placement/work placement/year abroad:**

The department encourages students to use the Go Abroad scheme

35. **Liaison between the Level 2 Schools/Institutes involved:**

n/a

Part E: Learning, Teaching And Assessment Strategies

36. **Learning, Teaching and Assessment Strategies:**

The Learning, Teaching and Assessment strategies are the same as those for other Physics undergraduate degree provision in Liverpool. The teaching and assessment are designed to facilitate the development of understanding and utilisation of the practical, mathematical and problem-solving skills widely expected of Physics graduates. The teaching combines classroom methods such as lectures, workshops, problems classes and tutorials, together with a strong emphasis on practical laboratory training and project work. It also makes use of subject-specific e-learning resources, as well as digital technologies provided as standard by the university of Liverpool, such as VITAL, to support students’ private study. Teaching includes both formative and summative instruction to ensure that students are provided with opportunities to assess their own learning. Assessment is through combinations of examinations and/or continuous assessment appropriate for each module to assess the progress of students.

36a. **Learning, Teaching and Assessment methods:**

- The Programme material is delivered in modules, which are defined in the Department’s Undergraduate Student Handbook in terms of aims, learning objectives and assessment.
- In the majority of modules the primary mode of delivery are the lectures, which introduce the student to the subject, map out the module content and give structure to the module.
- Lecture–based modules in Years 1 and 2 are augmented by integrated
sets of workshops or problems classes which provide the students with the opportunity to practise the application of the lecture material in a structured environment.

- In Year 3 small–group tutorials, led by lecturers who are specialists in a relevant research field, allow a deeper exploration of the module material. The tutor can use his/her research experience to steer the tutorial and can adapt in a flexible way to the learning needs of the small number of students.
- Emphasis is also placed on the importance of students’ private study, with recommended private study times listed in the Student Handbook. The private study will be typically a combination of revising the lecture notes, reading recommended texts and using e-learning resources (such as Mastering Physics).
- Practical work is varied and progressive throughout the three years of the Programme. It includes a 15 credit project in Year 3.
- Experience in computing and IT skills is based around an introductory module PHYS105/115/135/165 in Year 1 and a programming module PHYS205/PHYS265 in Year 2. These skills are applied in all of the practical work.
- Subject–specific and generic skills are taught and developed progressively throughout the Programmes. Written and oral communication skills, problem–solving skills, analysis skills and general study skills are embedded in the curriculum of Years 1 and 2 and practised throughout Year 3.
- Oral communication skills develop as the students gain experience. Year 1 – a short presentation of a scientific topic to a year sub-group; Year 2 – a short presentation to academic staff; Year 3 – a 15-minute project presentation, including questions, to students and academic staff.
- Assessment is by end–of–semester examinations or continuous assessment. The various assessment components are intended to guide the student towards a balanced study of the subject and to measure as fairly as possible their ability. Examinations consist of questions designed to test knowledge and understanding as well as problem solving, analytical skills and insight.
- Continuous assessment forms a significant component of the assessment of modules in Years 1 and 2, where weekly problems classes and e-learning assignments contribute.

### Assessment information for students:

<table>
<thead>
<tr>
<th>Marking Descriptors for Physics Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(Other than practicals and projects)</strong></td>
</tr>
</tbody>
</table>

**Marks in the range 90 - 100**
Candidates will demonstrate a comprehensive understanding of a wide range of physical laws and the ability to apply them to develop mathematical models or, in the context of a project, in diverse areas of physics. Answers will be logically structured and directly relevant to the question or problem and demonstrate a mature ability to communicate physical arguments and an understanding of relevant current issues where appropriate. Solutions to numerical questions or measurements made will clearly and concisely identify the relevant physical principles and demonstrate a high level of analytical ability and numerical accuracy.

**Marks in the range 80 - 89**
Candidates will demonstrate a comprehensive understanding of a range of physical laws and the ability to apply them to develop mathematical models or, in the context of a project, in diverse areas of physics. Answers will be logically structured and directly relevant to the question or problem and demonstrate a well-developed ability to communicate physical arguments. Solutions to numerical questions or measurements made will clearly identify the relevant physical principles and demonstrate analytical competence and a high level of numerical accuracy.

**Marks in the range 70 - 79**
Candidates will demonstrate a comprehensive understanding of fundamental physical laws and the ability to apply them to develop mathematical models or, in the context of a project, in diverse areas of physics. Answers will be logically structured and directly relevant to the question or problem and demonstrate an ability to communicate physical arguments. Solutions to numerical questions or measurements made will clearly identify the relevant physical principles and demonstrate a high level of numerical accuracy.

**Marks in the range 60 - 69**
Candidates will demonstrate a sound understanding of fundamental physical laws and their use in developing mathematical models or their application in the context of a project. Answers will be logically presented, but with some omissions and irrelevant material. Solutions to numerical questions or measurements made will use the relevant physical principles and achieve a good level of accuracy.

**Marks in the range 50 - 59**
Candidates will display a sound knowledge of fundamental physical laws and an appreciation of their use in developing physical models or their application in the context of a problem. Answers will be based mainly on teaching inputs, with omissions and irrelevant material indicating a deficiency in overall understanding. Solutions to numerical questions will demonstrate an ability in numerical manipulation but may contain errors of argument and incomplete calculations. Measurements made in the context of a project will be sufficient but may contain some errors.

**Marks in the range 40 - 49**
Candidates will display an adequate knowledge of fundamental physical laws and an appreciation of their use in developing physical models or their application in the context of a problem. Answers will be based on teaching inputs, with significant omissions and irrelevant material, and will lack logical structure with little evidence of overview of the subject. Solutions to numerical questions will demonstrate a limited ability in numerical manipulation and will include errors of argument and incomplete and inaccurate calculations. Measurements made in the context of a project will be adequate but may contain some errors and deficiencies.

**Marks in the range 35 to 39**
Candidates will display a limited knowledge of fundamental physical laws and a limited appreciation of their use in developing physical models or their application in the context of a project. Answers will be based on teaching inputs, with significant omissions and irrelevant material, and will lack logical structure with little evidence of understanding or overview of the subject. Solutions to numerical questions will demonstrate a very limited ability in numerical manipulation and will include serious errors of argument and incomplete and inaccurate calculations. Measurements made in the context of a project will be adequate but may contain some errors and deficiencies.

**Marks in the range 30 to 34**
Candidates will display an inadequate knowledge of fundamental physical laws and little appreciation of their use in developing physical models or their application in the context of a project. Answers will be based on a confused presentation of teaching inputs, with serious
omissions and irrelevant material, and will lack logical structure with little evidence of understanding or no overview of the subject. Solutions to numerical questions or measurements made in a project will be incomplete and may contain errors and deficiencies.

**Marks in the range 20 to 29**
Candidates will display an inadequate knowledge of fundamental physical laws and lack appreciation of their use in developing physical models or their application in the context of a project. Answers will be based on a confused presentation of teaching inputs, with serious omissions and irrelevant material, and will lack logical structure with no evidence of understanding or overview of the subject. Solutions to numerical questions or measurements made in a project will be incomplete and may contain significant errors and deficiencies.

**Marks in the range 10 to 19**
Candidates will display little knowledge of fundamental physical laws and no appreciation of their use in developing physical models or their application in the context of a project. Answers will be confused and fragmentary and will lack logical structure with no evidence of understanding or overview of the subject. Solutions to numerical questions or measurements made in a project will be incomplete and will contain significant errors and serious deficiencies.

**Marks in the range 0 to 9**
Candidates will display very little knowledge of fundamental physical laws and no appreciation of their use in developing physical models or their application in the context of a project. Answers will be confused and fragmentary with no logical structure or evidence of understanding. Solutions to numerical questions or measurements made in a project will be fragmentary and will contain serious errors and deficiencies.

**Marking descriptors for laboratory-based modules**

<table>
<thead>
<tr>
<th>Marks</th>
<th>FHEQ Level 4 and 5</th>
<th>FHEQ Level 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-100</td>
<td>Practical work completed flawlessly. Very good understanding of topic; puts practical work well in context where appropriate; very well laid out; drawings, diagrams, graphs, data analysis and error analysis of high quality, extremely well written.</td>
<td>Practical work completed to professional standard. Very good understanding of topic; excellent grasp of general physical concepts and specialist topics. Work very well laid out; drawings, diagrams, graphs, data analysis and error analysis of very high quality, extremely well written. Ability to apply knowledge to new problems; work shows evidence of supplementary reading.</td>
</tr>
<tr>
<td>70-79</td>
<td>Practical work completed flawlessly. Good understanding of topic; puts practical work in context where appropriate; very well laid out; drawings, diagrams, graphs, data analysis and error analysis of high quality, well written. Compounds prepared in very good yield/purity.</td>
<td>Practical work completed flawlessly. Very good understanding of topic; very good grasp of general physical concepts and specialist topics. Work laid out very well; drawings, diagrams, graphs, data analysis and error analysis of high quality, well written. Ability to apply knowledge to new problems; work shows evidence of supplementary reading.</td>
</tr>
</tbody>
</table>
| 60-69 | Practical work completed. Good understanding of topic; well laid out; good drawings, diagrams, graphs / data analysis / error analysis; very few errors; well written. | Practical work completed to a good standard. Good understanding of topic; good grasp of general physical concepts and specialist topics. Work laid out very well; drawings, diagrams, graphs, data analysis /
<table>
<thead>
<tr>
<th>Mark</th>
<th>Description</th>
<th>Additional Information</th>
</tr>
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<tbody>
<tr>
<td>50-59</td>
<td>Practical work completed. General understanding of topic, but some errors or key points not understood; layout and data analysis not always appropriate; drawings, diagrams / graphs / error analysis at least adequate; expression and style adequate; grammar and spelling generally precise.</td>
<td>Practical work completed. General understanding of topic, but some errors or key points not understood; good grasp of most physical concepts; some evidence of specialist knowledge. Layout of work and data analysis not always appropriate; drawings, diagrams / graphs / error analysis at least adequate; expression and style adequate; grammar and spelling generally precise.</td>
</tr>
<tr>
<td>40-49</td>
<td>Practical work incomplete. Shows some understanding but report incomplete, with errors; coverage of topic poor; layout and data analysis poor; error analysis poor; some drawings / diagrams / graphs / adequate, expression and style only adequate, with spelling / grammatical errors fairly common.</td>
<td>Practical work incomplete. Shows some understanding but report incomplete, with errors; coverage of topic poor; very limited evidence of specialist knowledge. Layout of work, data analysis and error analysis adequate; some drawings / diagrams / graphs adequate, expression and style only adequate, with spelling / grammatical errors fairly common.</td>
</tr>
<tr>
<td>35-39</td>
<td>Sufficient to allow progression to next year of study. Major deficiencies in practical work. At least some relevant information and general drift sensible, but report incomplete with poor understanding; many errors; layout poor; drawings / diagrams / graphs barely adequate; error analysis inadequate or missing; expression and style mostly poor; spelling / grammar poor.</td>
<td>Major deficiencies in practical work. At least some relevant information and general drift sensible, but report incomplete with poor understanding; many errors; layout poor; drawings / diagrams / graphs barely adequate; error analysis inadequate or missing; expression style, grammar, spelling poor to dreadful.</td>
</tr>
<tr>
<td>&lt; 35</td>
<td>Very deficient or inadequate. Insufficient to allow progression to next year of study. Major deficiencies in practical work. Poor to no understanding of topic; very many errors and omissions; little or no substance; layout very poor or totally inappropriate; drawings, diagrams, graphs poor to totally inadequate; error analysis inadequate or missing; expression style, grammar, spelling poor to dreadful.</td>
<td>Major deficiencies in practical work. At least some relevant information and general drift sensible, but report incomplete with poor understanding; many errors; layout poor; drawings / diagrams / graphs barely adequate; error analysis inadequate or missing; expression and style mostly poor; spelling / grammar poor.</td>
</tr>
</tbody>
</table>

Marking descriptors for project-based modules

<table>
<thead>
<tr>
<th>Mark</th>
<th>Description</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-100</td>
<td>Worked autonomously with a minimum of verbal guidance, and needed only essential supervision (e.g. demonstration of new techniques). Perceptive judgements made on various sources with very little prompting. Showed outstanding initiative and introduced and implemented a number of original ideas which showed remarkable insight at this level. Showed outstanding commitment and dedication to all aspects of the work during the allotted time. The student overcame difficulties or independently sought help where needed, specifying the</td>
<td></td>
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<tr>
<td>Score Range</td>
<td>Summary</td>
<td></td>
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<tr>
<td>-------------</td>
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</tr>
<tr>
<td>80-89</td>
<td>Worked very effectively with only limited guidance, and needed only essential supervision (e.g. demonstration of new techniques). Perceptive judgements made on various sources of experimental data/theory with very little prompting. Showed great initiative and introduced and implemented a number of original ideas. Was fully committed, spending all recommended time working on the project, and working very diligently during this time. The student independently sought help when needed, specifying the problem succinctly and clearly. The student communicated with the supervisor regularly, presenting primary results clearly with only very minor room for improvement. Conclusions (even if these later turned out to be erroneous!) were clearly justified.</td>
<td></td>
</tr>
<tr>
<td>70-79</td>
<td>Worked effectively with some verbal guidance, and needed only modest supervision. Sound, independent interpretation of experimental/data theory from several sources. Clearly understood and took responsibility for the progress of the project and regularly made useful suggestions about further developments. Was fully committed, spending almost all recommended time working on the project, and working very diligently during this time. The student independently sought help when needed, specifying the problem succinctly and clearly. The student communicated with the supervisor regularly, presenting primary results clearly with only very minor room for improvement. Conclusions (even if these later turned out to be erroneous!) were justified, with only minor room for improvement.</td>
<td></td>
</tr>
<tr>
<td>60-69</td>
<td>Worked effectively with verbal guidance, but needed some practical supervision. Independent attempts to assess experimental data/theory largely successful, but some help needed in more difficult or unusual cases. Occasional suggestions made about development of project. Was certainly committed, spending most of the recommended time working on the project and working hard most of the time. The student usually sought help when needed, but sometimes needed prompting to recognise a problem. Once recognised though he or she could express the problem clearly. The student communicated with the supervisor regularly, primary results and conclusions were clearly presented and justified, again with some room for improvement.</td>
<td></td>
</tr>
<tr>
<td>50-59</td>
<td>Worked effectively with verbal guidance, but needed significant practical supervision. Independent attempts to assess experimental data/theory, but help often needed. Occasional suggestions made about development of project. Worked reasonably hard and spent sufficient time and effort to ensure adequate results.</td>
<td></td>
</tr>
<tr>
<td>40-49</td>
<td>Did not work effectively given only verbal guidance and significant supervision needed even with common procedures. Some independent interpretation of data attempted, but needed help even with quite straightforward problems. Limited initiative shown and no attempt made to suggest original idea. Was rather laid-back and showed a certain lack of commitment, spending insufficient time on the project, and not working all that hard. The student did not recognise problems when they arose in the project, and, even after prompting did not seem to be able to specify the problem in a clear way. The student communicated with the supervisor only when pushed. Some attempt was made to present primary results and conclusions, though the manner in which this was done left considerable room</td>
<td></td>
</tr>
</tbody>
</table>
35-39 Did not work effectively given only verbal guidance, and constant supervision needed. Independent interpretation of data, if attempted at all, was usually flawed in some important respect. No initiative shown and no attempt made to suggest original ideas. Did the very bare minimum of work, significantly less than would have been expected from an average student. The student did not recognise problems when they arose in the project, and, even after prompting did not seem to be able to specify the problem in a clear way. The student made no real attempt to communicate with the supervisor even when pushed. When results and conclusions were finally extracted they were unclear, ambiguous and unreliable.

20-34 Did not work effectively given only verbal guidance, and constant supervision needed even with trivial tasks. No attempt to interpret data independently. No initiative shown and no attempt made to suggest original ideas. Through infrequent attendance or poor commitment when present, failed to make any significant progress. Few inarticulate attempts to communicate with the supervisor were made, poor communication generated problems with the project.

1-19 Woefully deficient effort in all respects.

0 No evidence of activity.

38. Student representation and feedback:

- The Student–Staff Committee of the Department of Physics operates in accordance with the University Code of Practice on Student Representation. The Student–Staff Committee normally meets twice per semester. The membership of the Student–Staff Committee, its terms of reference, and the manner in which it conducts its business conforms to the requirements of the Annex of the Code of Practice on Student Representation. Elections to the Student–Staff Committee are carried out within the structure determined by the University Student Representation Steering Group and Programme Representatives are encouraged to attend the training provided for them through the Liverpool University Student Training Initiative.

- The Students are represented by students from each year of study elected by students registered for Physics modules at elections organised by the Department. The Staff include the Programme Director for F351, the Head of Department, the Chair of the Board of Studies in Physics, the Director of Learning and Teaching, the Coordinator of Astrophysics Teaching at Liverpool John Moores University, the Year Coordinators and the other Programme Directors. A member of staff acts as coordinator for the Committee, reports students’ views to the Board of Studies and feeds back the Board’s response to the Committee.

- In addition, questionnaires are used annually in all modules to determine student reaction to the syllabus, the level of treatment, the relevance, the delivery and other aspects of the module. The returns are analysed by the lecturer, examined by the Director of Learning and Teaching and a summary is fed back to the students.

Part F: Status Of Professional, Statutory Or Regulatory Body Accreditation
39. **Status of Professional, Statutory or Regulatory Body Accreditation:**

Institute of Physics - Last accreditation March 2014

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**Part G: Diversity & Equality Of Opportunity And Widening Participation**

40. **Diversity & Equality of Opportunity and Widening Participation:**

The programme’s design, structure and content are consistent and compliant with the University’s Policy on Diversity and Equality of Opportunity.

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**Annex 1**

Annex of Modifications Made to the Programme

Please complete the table below to record modifications made to the programme.

<table>
<thead>
<tr>
<th>Description of modification (please include details of any student consultation undertaken or confirm that students’ consent was obtained where this was required)</th>
<th>Minor or major modifications</th>
<th>Date approved by FAQSC</th>
<th>Date approved by AQSC (if applicable)</th>
<th>Cohort affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 2011- Substantive restructuring of the delivery and assessment (but not the overall content) of Level 1 and Level 2 modules. Students were consulted during all planning stages over the period 2009-2011</td>
<td>Major</td>
<td>19 May 2011</td>
<td>22 May 2011</td>
<td>2011-12</td>
</tr>
</tbody>
</table>