

# Programme Specification: Undergraduate

## For students starting in Academic Year 2022/2023

### 1. Course Summary

|  |  |
|--|--|
| Name of programme & award title with UCAS code | Computer Science / Physics [FG34]  |
| Awarding Institution                           | Aberystwyth University   |
| Individual Accreditation(s)                    | Recognised by the Institute of Physics (IOP) for the purpose of eligibility for Associate Membership.  |
| Final Award                                    | Bachelor of Science  |
| Date of Publication                            | September 2023   |
| QAA Subject Benchmark                          | <p><b>Information provided by Department of Computer Science</b><br/>The Computer Science part of this Programme Specification has been designed to conform to the QAA Benchmark statement for Computing.</p> <p><b>Information provided by Department of Physics</b><br/>Details of the QAA Benchmark statement for Physics, Astronomy and Astrophysics can be found <a href="#">here</a></p> |

How this information might change: Please read the important information at <https://www.aber.ac.uk/en/study-with-us/ug-studies/terms-conditions/>. This explains how and why we may need to make changes to the information provided in this document and to help you understand how we will communicate with you if this happens.

### 2: Duration

| Programme                         | Years |
|-----------------------------------|-------|
| Computer Science / Physics [FG34] | 3     |

### 3: Educational aims of the programme

## Information provided by Department of Computer Science

This three-year joint honours degree scheme is offered jointly between Computer Science and a second department. Students spend equal amounts of time in both departments and whilst they may not cover the breadth of the two subjects, they certainly cover the main core areas.

From the Computer Science perspective:

The aim of this degree scheme is to produce good quality computing graduates with a strong software engineering bias who are highly sought after by industry. The scheme has a well-defined set of core modules that must be studied to ensure that graduates have a wide range of experiences with a good grounding in the major fields of Computing.

The scheme has the following fundamental aims:

- ? to enable students to develop the skills to be expected of any graduate, including the following skills:  
to reason logically and creatively; to communicate clearly both orally and in writing; and to be able to obtain and interpret information from a wide range of sources
- ? to equip students with the skills necessary to program in high-level computing languages
- ? to enable students to understand and apply the range of principles and tools available to the software engineer
- ? to give students a good grounding in the major fields of Computing through a wide range of experiences
- ? to give students an appreciation of the political, economic, legal and social issues surrounding software.
- ? to instil the professional and ethical responsibilities required of computer practitioners
- ? to produce graduates who have the potential to succeed in a rapidly changing industry

## Information provided by Department of Physics

- To provide a programme in which the study of physics can be combined with that of computer science, such that student time is divided equally between both disciplines.
- To provide, through an Institute of Physics recognised programme, a thorough understanding of the core principles of physics within the general areas of classical and quantum physics.
- To ensure that research activity informs the learning and teaching process.
- To produce graduates with competence in subject-specific skills of scientific methodology, experimental techniques, modelling, numerical and computational methods and problem solving.
- To provide training in, and use of, a wide range of transferable key skills needed for employment at a graduate level.

## 4: Intended learning outcomes

### Information provided by Department of Computer Science

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas as identified in the QAA benchmark for Computing which may be found on-line at:

<http://www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/Subject-benchmark-statement-Computing.aspx>

and is displayed in the tables below.

A document that links detailed Body of Knowledge topics from the subject benchmark to specific UWA modules may be found at:

See section 11 for a detailed list of modules and options required for this scheme.

120 credits in years 2 and 3 must be at level 3.

### Information provided by Department of Physics

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas:

## 5: Knowledge and understanding

### Information provided by Department of Computer Science

The scheme focuses on the following components of the QAA benchmark:

|                              |  |
|------------------------------|--|
| Hardware                     |  |
|                              | Computer architecture and construction         |
|                              | Processor architecture                         |
|                              | Device level issues and fabrication technology |
| Software                     |  |
|                              | Programming languages                          |
|                              | Software tools and packages                    |
|                              | Computer applications                          |
|                              | Structuring of data and information            |
| Communications & interaction |  |
|                              | Computer networks, distributed systems         |
|                              | Human-computer interaction                     |
|                              | Operating systems                              |
| Practice                     |  |

|        |   |
|--------|---|
|        | Problem identification and analysis         |
|        | Design, development, testing and evaluation |
|        | Management and organisation                 |
|        | Professionalism and ethics                  |
|        | Commercial and industrial exploitation      |
| Theory |   |
|        | Algorithm design and analysis               |
|        | Modelling and frameworks                    |
|        | Analysis, prediction and generalisation     |
|        | Human behaviour and performance             |

And will equip students in the following Computer Related Cognitive areas:

*Knowledge and understanding: demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to Computing and computer applications.*

*Modelling: use such knowledge and understanding in the modelling and design of computer-based systems for the purposes of comprehension, communication, prediction and the understanding of trade-offs.*

*Requirements, practical constraints and computer-based systems (including computer systems, information systems, embedded systems and distributed systems) in their context: recognise and analyse criteria and specifications appropriate to specific problems, and plan strategies for their solution.*

*Critical evaluation and testing: analyse the extent to which a computer-based system meets the criteria defined for its current use and future development.*

*Methods and tools: deploy appropriate theory, practices and tools for the specification, design, implementation and evaluation of computer-based systems.*

*Reflection and communication: present succinctly to a range of audiences (orally, electronically or in writing) rational and reasoned arguments that address a given information handling problem or opportunity. This includes assessment of the impact of new technologies.*

*Professional considerations: recognise the professional, moral and ethical issues involved in the exploitation of computer technology and be guided by the adoption of appropriate professional, ethical and legal practices.*

The first year is split only on whether students have previous programming experience. If they do, then they receive a more intense programming course, and have a chance to take a further option in the first semester. The remaining modules are common to all students on the scheme.

The second year builds on the information and techniques studied in the first year by expanding them further and introducing more specialised subjects. This year includes a required module with a group project.

The third year introduces the most advanced topics of the degree scheme and includes a required individual project that allows the student to gain deeper knowledge and understanding in an area of particular interest.

### **Information provided by Department of Physics**

- Fundamental concepts of a core of physics.
- Applications of these fundamentals to advanced topics approaching the frontiers of the subject where practicable.
- Appropriate working knowledge of mathematical techniques.
- A range of skills in practical physics, including experimental work, data manipulation and numerical modelling.

Teaching, learning and assessment methods used to enable outcomes to be achieved and demonstrated

- Lectures
- Problem classes
- Seminars
- Laboratory work
- Group and individual projects
- Visiting lecturer series

Assessment

- Time-constrained examinations
- Open and closed book tests
- Problem sheets
- Laboratory diaries and reports
- Project reports
- Oral presentations
- Computer programmes and assignments

## **6: Skills and other attributes**

### **Information provided by Department of Computer Science**

The Computing schemes at Aberystwyth have a significant emphasis on vocational skills. All students are encouraged to participate in an optional industrial year scheme that strongly enhances the professional practical experiences of the graduates.

In this scheme, students will also be expected to develop practical computer related skills giving them:

*The ability to specify, design and construct computer-based systems.*

*The ability to evaluate systems in terms of general quality attributes and possible trade-offs presented within the given problem.*

*The ability to recognise any risks or safety aspects that may be involved in the operation of computing equipment within a given context.*

*The ability to deploy effectively the tools used for the construction and documentation of computer applications, with particular emphasis on understanding the whole process involved in the effective deployment of computers to solve practical problems.*

*The ability to work as a member of a development team, recognising the different roles within a team and different ways of organising teams.*

*The ability to operate computing equipment effectively, taking into account its logical and physical properties.*

### **Information provided by Department of Physics**

#### Intellectual skills

- Acquisition of analytical and problem-solving skills
- Numerical skills
- Planning, execution and reporting of an experiment or investigation
- Experience of independent work in physics
- Development of mathematical and computing skills used to model and describe the physical world

Teaching, learning and assessment methods used to enable outcomes to be achieved and demonstrated (examples)

- Seminars
- Laboratory classes
- Group and individual projects
- Lectures

#### Assessment

- Example sheets
- Laboratory diaries and reports
- Group and individual project reports
- Time constrained examinations
- Oral presentations
- Open and closed book tests

## **7: Transferable/Key skills**

### **Information provided by Department of Computer Science**

On completion of the programme the student will be able to take responsibility for themselves and their work. S/he will be able to:

- Work independently
- Work in a team
- Respect the views and beliefs of others
- Listen
- Communicate orally
- Communicate in writing
- Communicate electronically

- Word-process
- Use the Web
- Manage time and work to deadlines
- Research issues
- Solve problems
- Adapt to change
- Develop career awareness

And s/he will exhibit:

|  |
|--|
| <i>Effective information-retrieval skills (including the use of browsers, search engines and catalogues).</i>          |
| <i>Numeracy in both understanding and presenting cases involving a quantitative dimension.</i>                         |
| <i>Effective use of general IT facilities.</i>   |
| <i>Managing one's own learning and development including time management and organisational skills.</i>                |
| <i>Appreciating the need for continuing professional development in recognition of the need for lifelong learning.</i> |

**Information provided by Department of Physics**

- Problem-solving and analytical skills
- Working in groups
- Time-management and planning
- Written and oral communication skills
- IT skills
- Independent learning skills
- Investigative skills

Teaching, learning and assessment methods used to enable outcomes to be achieved and demonstrated

- Group project work
- Individual project work
- Oral examinations
- Example sheets

**8: Work-based learning (where appropriate)**

**9: What is the structure of the programme?**

**Year 1 Core modules**

**Core (60 Credits)**

| Name                                    | Module Code             | Credits | Semester   |
|---|-------------------------|---------|------------|
| Introduction to Computer Infrastructure | <a href="#">CS10220</a> | 20      | Semester 1 |

|   |                         |    |            |
|---|-------------------------|----|------------|
| Introduction to Programming                   | <a href="#">CS12020</a> | 20 | Semester 1 |
| Programming Using an Object-Oriented Language | <a href="#">CS12320</a> | 20 | Semester 2 |

### Core (60 Credits)

| Name  | Module Code             | Credits | Semester   |
|---|-------------------------|---------|------------|
| Calculus  | <a href="#">MP10610</a> | 10      | Semester 1 |
| Further Algebra and Calculus                                | <a href="#">MP11010</a> | 10      | Semester 2 |
| Modern Physics  | <a href="#">PH14310</a> | 10      | Semester 2 |
| Laboratory Techniques for Experimental Physics (10 Credits) | <a href="#">PH15510</a> | 10      | Semester 2 |
| Laboratory Techniques for Experimental Physics (10 Credits) | <a href="#">PH15510</a> | 10      | Semester 2 |
| Algebra and Differential Equations                          | <a href="#">PH16210</a> | 10      | Semester 1 |
| Classical Dynamics  | <a href="#">PM14010</a> | 10      | Semester 1 |

### Year 2 Core modules

#### Core (40 Credits)

| Name                 | Module Code             | Credits | Semester   |
|----------------------|-------------------------|---------|------------|
| Software Engineering | <a href="#">CS22120</a> | 20      | Semester 2 |
| Scientific Python    | <a href="#">CS24400</a> | 0       | Semester 1 |
| Scientific Python    | <a href="#">CS24420</a> | 20      | Semester 2 |

#### Core (60 Credits)

| Name | Module Code | Credits | Semester |
|------|-------------|---------|----------|
|------|-------------|---------|----------|

|                                 |                         |    |            |
|---------------------------------|-------------------------|----|------------|
| Thermodynamics                  | <a href="#">PH21510</a> | 10 | Semester 1 |
| Optics                          | <a href="#">PH22010</a> | 10 | Semester 2 |
| Electricity and Magnetism       | <a href="#">PH22510</a> | 10 | Semester 2 |
| Principles of Quantum Mechanics | <a href="#">PH23010</a> | 10 | Semester 2 |
| Mathematical Physics            | <a href="#">PM26020</a> | 20 | Semester 1 |

## Year 2

**Options** Choose 20 credits, as advised by the computer science department.

| Name                                   | Module Code             | Credits | Semester   |
|--|-------------------------|---------|------------|
| Dylunio Algorithmau a Strwythurau Data | <a href="#">CC21120</a> | 20      | Semester 1 |
| Modelu Data Parhaus                    | <a href="#">CC27020</a> | 20      | Semester 1 |
| Algorithm Design and Data Structures   | <a href="#">CS21120</a> | 20      | Semester 1 |
| Modelling Persistent Data              | <a href="#">CS27020</a> | 20      | Semester 1 |

## Final Year Core modules

**Core (60 Credits)**

| Name                                   | Module Code             | Credits | Semester   |
|--|-------------------------|---------|------------|
| Concepts in Condensed Matter Physics   | <a href="#">PH32410</a> | 10      | Semester 1 |
| Particles, Quanta and Fields           | <a href="#">PH33000</a> | 0       | Semester 1 |
| Particles, Quanta and Fields           | <a href="#">PH33020</a> | 20      | Semester 2 |
| Practical Research Skills (10 credits) | <a href="#">PH35110</a> | 10      | Semester 1 |

|                      |                         |    |            |
|----------------------|-------------------------|----|------------|
| Project (20 Credits) | <a href="#">PH35620</a> | 20 | Semester 2 |
|----------------------|-------------------------|----|------------|

### Core (30 Credits)

| Name                          | Module Code             | Credits | Semester   |
|-------------------------------|-------------------------|---------|------------|
| Agile Development and Testing | <a href="#">CS31310</a> | 10      | Semester 1 |
| Minor Project                 | <a href="#">CS39620</a> | 20      | Semester 2 |

### Final Year

**Electives** Choose 30 credits, as advised by the computer science department.

## 10: University Regulations

Details of University Regulations can be found at <https://www.aber.ac.uk/en/academic-registry/handbook/regulations/>

## 11: Support for students and their learning

### Information provided by Department of Computer Science

The Department encourages students to take advantage of centrally provided services including Information Services, University Welfare, the Language and Learning Centre, Development and External Affairs (study abroad) , module descriptions, online student data, and the Careers Advisory Service.

In addition, the department also provides the following support facilities to assist students:

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| Familiarisation sessions at start of scheme to assist in orientation;  |
| On-line lecture support material (notes, revision aids, etc.);   |
| Certain key modules are presented in a managed learning environment that promotes student centred learning.                          |
| Activity weekend to enhance interpersonal skills and to introduce group work;  |
| Tutorial system to support key modules in each year;   |
| Personal tutors allocated to all students. Their role is to assist students with personal problems and to advise on pastoral issues; |
| A mature student's tutor and an Overseas student's tutor provide additional support;   |
| Open-door access to all staff, including Lecturers, Year Coordinators, Head of Teaching, Head of Department;                         |
| Close collaboration between tutors, accommodation office, medical centre and student welfare;  |

|  |
|--|
| Industrial Awareness weekend to enhance student employability;   |
| Assistance in securing industrial placement on Year in Employment Scheme;  |
| Specific contacts in the USA and Europe to facilitate exchange years;  |
| Staff visits when taking optional industrial years;  |
| For Welsh speakers the department arranges tutorials to enable the students to develop their professional skills in both languages |

## 12: Entry Requirements

### Information provided by Department of Computer Science

### Information provided by Department of Computer Science

One of the following is normally required:

| UCAS Tariff | International<br>Baccalaureate | European<br>Baccalaureate |
|-------------|--------------------------------|---------------------------|
| 280 points  | 28                             | 75%                       |

A minimum of a C grade at GCSE in Mathematics and English or Welsh is also required.

The Department readily accepts other qualifications which are considered equivalent.

Applications from mature students lacking standard qualifications are welcomed.

### Information provided by Department of Physics

Details of Degree Course Requirements can be found by [clicking this link](#).

Applications submitted on the basis of other qualifications and applications from mature candidates are welcomed and will be considered on an individual basis.

Details of entry requirements for the scheme can be found at <https://courses.aber.ac.uk/>

## 13: Methods for evaluating and improving the quality and standards of teaching and learning

## 14: Regulation of Assessment

### Information provided by Department of Computer Science

The scheme uses standard institutional regulations for progression and honours classification.

In addition, the department requires that a student must :

- normally gain at least 40% in appropriate Part I modules in order to progress to Part II of the scheme;
- gain at least 40% in their major project on the first attempt in order to gain an Honours degree in this scheme .

#### Role of the External Examiners

An external examiner is appointed, under the terms of the University's policy, with specific responsibility for this scheme. The Department has two undergraduate externals and both are

encouraged to comment on any aspect of our teaching and assessment. We hold one examination board for all undergraduate schemes at which both externals are present.

Academic Regulations are published as Appendix 2 of the Academic Quality Handbook:  
<https://www.aber.ac.uk/en/aqro/handbook/app-2/>

## 15: External Examiners

External Examiners fulfill an essential part of the University's Quality Assurance. Annual reports by External Examiners are considered by Faculties and Academic Board at university level.

## 16: Indicators of quality and standards

### Information provided by Department of Computer Science

In addition to standard College procedures and audits our principle quality standards are those provided through accreditation of degrees by the British Computer Society. This body, under the Engineering Council, provides guidance and discipline for all schemes, including those not presented for accreditation.

#### Notes

1. 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 he/she takes full advantage of the learning opportunities that are provided. Detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in the on-line module descriptions (<http://www.aber.ac.uk/modules/>).  
This document is available on-line. (<http://www.aber.ac.uk/prog-specs/Compsci.shtml>)  
The accuracy of the information contained in this document is reviewed by the University and may be checked by the Quality Assurance Agency for Higher Education.
2. This specification defines the details of the degree scheme at the time of writing. Given the nature of this rapidly evolving discipline this specification should not be considered a definitive statement about all graduates of the scheme.

### Information provided by Department of Physics

- External examiner's reports
- Institute of Physics report
- University departmental audits
- QAA institutional reviews

The Department Quality Audit questionnaire serves as a checklist about the current requirements of the University's Academic Quality Handbook. The periodic Department Reviews provide an opportunity to evaluate the effectiveness of quality assurance processes and for the University to assure itself that management of quality and standards which are the responsibility of the University as a whole are being delivered successfully.