Subject Benchmark Statement: Physics, Astronomy and Astrophysics

The Basics

This summary is designed to provide a short and accessible overview of the Subject Benchmark Statement for Physics, Astronomy and Astrophysics for students, employers and academics. It is not intended to replace or alter the Statement, which should be referred to in the design and approval of courses and when any further detail is required.

Subject Benchmark Statements describe the nature of study and the benchmark academic standards expected of graduates in specific subject areas, and in respect of particular qualifications. They provide a picture of what graduates in a particular subject might reasonably be expected to know, do and understand at the end of their course or programme.

Subject Benchmark Statements are presented in four sections. Section 1 outlines the contextual information - providing the operational landscape, and boundaries, of subject discipline. This includes consideration of the ways in which the discipline addresses wider social goals, specifically in relation to: equity, diversity and inclusion (EDI); accessibility and the needs of disabled students; education for sustainable development (ESD); enterprise and entrepreneurship; and the impact of generative artificial intelligence on the subject practice.

Section 2 covers distinctive features of the course, including curriculum design, partnership arrangements, flexibility of delivery, progression and ongoing monitoring processes. Section 3 explains any features relevant to teaching, learning and assessment activities for the subject. Section 4 describes the benchmark standards of achievement reached by all graduates with a bachelor's degree with honours in the subject, with some subjects also including achievement at master's level.

Why study a degree in Physics, Astronomy and Astrophysics?

Physics deals with profound questions about the nature of the Universe and with some of the most important practical, environmental and technological issues of our time – examples are energy, climate and sustainability. Its scope is broad and involves mathematics and theory, experiments and observations, computing and technology. Physics is characterised by the idea that systems can be understood by identifying a few key quantities, such as energy and momentum, and the universal principles that govern them. Part of the appeal of the subject is that there are relatively few such principles and that these apply throughout science and not just in Physics. Progress in Physics requires imagination and creativity. It is often the result of collaboration between physicists from a diverse range of backgrounds (both culturally, and in the sense of sub-fields of Physics as well as experimentalists, computational physicists or theorists) and can involve the exchange of ideas and techniques from outside Physics. Examples include chemistry, computing, engineering, the life sciences and mathematics.

Studying Physics brings benefits that last a lifetime. These include:

- a practical approach to problem-solving, often using mathematical formulation and solution
- the ability to reason clearly and communicate complex ideas
- familiarity with information and communication technologies
- ability to judge statistical presentation of results
- acquisition of self-study, collaborative and teamwork skills
- the pleasure and satisfaction that comes from being able to understand the latest discoveries in science.

What are the main teaching and learning approaches in Physics, Astronomy and Astrophysics?

Physics, Astronomy and Astrophysics is a hierarchical discipline that lends itself to systematic exposition and the ordered and structured acquisition of knowledge. It is also an empirical subject. Practical skills, including an appreciation of the link between theory, experiment and observation, are developed. This leads to teaching methods (which may be in-person and/or online, synchronous and/or asynchronous as appropriate) that may include:

- lectures supported by problem-solving classes
- flipped classes
- small group tutorial work
- laboratory work
- observational work in Astronomy
- the use of textbooks, electronic resources and other self-study materials
- open-ended project work
- team-based activities
- activities devoted to generic and subject-specific skills development
- placements/visits to schools, or industrial or other research facilities.

Teaching and learning strategies are designed to provide students with appropriate subject knowledge, understanding, abilities and academic and professional skills especially valued by quantitative professions

How are students assessed?

Physics courses will typically employ different styles of assessment to test different learning outcomes. For example, examination and test questions may be used to assess understanding of concepts and the ability to develop mathematical models, complete calculations, solve new problems and communicate physical arguments. Some elements of time-constrained assessment may have a role in testing a student's capacity to organise work and to think and communicate under prescribed conditions. These will be augmented by other methods which include reports, presentations and reflective accounts. Such activity is often more appropriate for assessing skills such as – but not limited to – project planning and execution, use of software, coding, enterprise and entrepreneurship, communication, teamwork and research.

A variety of assessment methods are typically used within Physics courses, including:

- time-constrained examinations
- closed-book and open-book tests
- computerised adaptive testing
- problem-based assignments
- laboratory books and reports
- observation of practical skills
- individual project reports (including placement or case-study reports)
- team project reports
- presentations and/or posters
- appropriately arranged viva voce interviews
- essays
- project artefacts such as computer programmes, equipment, electronic circuits, videos or websites
- uses (and critical assessment) of outputs from GenAI
- educational resources from academic educational research used for teaching in higher education, schools and outreach
- reflective analysis
- peer and self-assessment.

Benchmark Standards

The minimum threshold and typical standards that a student will have demonstrated when they are awarded an honours degree in Physics, Astronomy and Astrophysics are outlined on **pages 16-17** of the Subject Benchmark Statement. Threshold standards for integrated master's degrees are also included on **page 18**. The vast majority of students will perform significantly better than the minimum threshold standards. Each higher education provider has its own method of determining what appropriate evidence of this achievement will be and should refer to Annex D in The Frameworks for Higher Education Qualifications of UK Degree-Awarding Bodies. This Annex sets out common descriptions of the four main degree outcome classifications for bachelor's degrees with honours - 1st, 2.1, 2.2 and 3rd.

The full statement was developed by subject experts drawn from across the sector. Details of the Advisory Group can be found on **page 20** of the Statement.

Subject Benchmark Statements are published in QAA's capacity as an expert quality body on behalf of the higher education sector.

Read the full Subject Benchmark Statement

The full Subject Benchmark Statement is available on the QAA website.

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