Comparison document

(Version 1.1 April 2015 compared to previous version)

Advanced Higher Physics Course Specification (C757 77)

The purpose of this document is to give a quick, visual guide to any amendments or clarifications made during the revision process.

Valid from August 2015

This edition: April 2015~~3~~, version 1.1~~0~~

Please refer to the note of changes at the end of this Course Specification for details of changes from previous version (where applicable).

Course outline

Course title: Advanced Higher Physics

SCQF: level 7 (32 SCQF credit points)

Course code: ~~to be advised~~C757 77

Mandatory Units

H7XD 77 Physics: Rotational Motion and Astrophysics (Advanced Higher)	**8 SCQF credit points**
H7XE 77 Physics: Quanta and Waves (Advanced Higher)	**8 SCQF credit points**
H7XF 77 Physics: Electromagnetism (Advanced Higher)	**4 SCQF credit points**
H7XG 77 Investigating Physics (Advanced Higher)	**4 SCQF credit points**

Course assessment **8 SCQF credit points**

This Course includes eight SCQF credit points to allow additional time for preparation for Course assessment. The Course assessment covers the added value of the Course. Further information on the Course assessment is provided in the Assessment section.

Recommended entry

Entry to this Course is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by the following or equivalent qualifications and/or experience:

- Higher Physics Course

Progression

This Course or its Units may provide progression to:

- an HND/degree in a physics-based course or a related area
- a career in a physics-based discipline or a related area

Further details are provided in the Rationale section.

Equality and inclusion

This Course Specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence. For further information, please refer to the *Course Support Notes.*

Rationale

All new and revised National Courses reflect Curriculum for Excellence values, purposes and principles. They offer flexibility, provide more time for learning, more focus on skills and applying learning, and scope for personalisation and choice.

In this Course, and its component Units, there will be an emphasis on skills development and the application of those skills. Assessment approaches will be proportionate, fit for purpose and will promote best practice, enabling learners to achieve the highest standards they can.

This Course provides learners with opportunities to continue to acquire and develop the attributes and capabilities of the four capacities, as well as skills for learning, skills for life and skills for work.

All Courses provide opportunities for learners to develop breadth, challenge and application, but the focus and balance of the assessment will be appropriate for the subject area.

Relationship between the Course and Curriculum for Excellence values, purposes and principles

Physics courses encourage the development of skills and resourcefulness, which leads to becoming a confident individual. Successful learners in physics think creatively, analyse and solve problems. This Course develops responsible citizens by allowing learners to investigate current areas of physics, including the impact it makes on their lives, on the environment, and on society.

The investigative and higher-order thinking skills developed throughout the Course will give learners opportunities to contribute to team working and to working more independently. This will develop attributes such as taking responsibility and ownership, self-motivation, using initiative and communication and interpersonal skills. This allows them to become creative, inventive and enterprising, in a world where the skills and knowledge developed by physics are needed across all sectors of society.

The Course provides opportunities for learners to acquire and apply knowledge, to evaluate environmental and scientific issues, to consider risk, and to make informed decisions. This will lead to learners developing an informed and ethical view of complex issues.

Purpose and aims of the Course

The Advanced Higher Physics Course has been designed to articulate with and provide progression from the (Revised) Higher Physics Course. Through a deeper insight into the structure of the subject, the Course aims to provide an opportunity for reinforcing and extending the candidate‘s knowledge and understanding of the concepts of physics and developing the candidate‘s skills in investigative practical work.

The purpose of the Course is to build on the knowledge and skills developed by the learner in the Higher Physics Course and to use their mathematical knowledge and skills to analyse and solve problems in real-life contexts.

As our understanding of physics and its potential applications is constantly evolving, our success as an industrial society depends on the development of young people who are secure in their knowledge of physics and who are resilient, adaptable, creative and inventive.

The Course offers opportunities for collaborative and independent learning set within familiar and unfamiliar contexts, and seeks to illustrate and emphasise situations where the principles of physics are used and applied, thus promoting the candidate's awareness that physics involves interaction between theory and practice. An opportunity for engaging in some independent research is provided. The resulting elements of knowledge and understanding and skills form the basis of the Advanced Higher Physics Course.

The study of Advanced Higher Physics should also foster an interest in current developments in and applications of physics, the willingness to make critical and evaluative comment, and the acceptance that physics is a changing subject. Positive attitudes, such as being open-minded and willing to recognise alternative points of view, are promoted.

The aims of the Course are to enable learners to:

- develop a critical understanding of the role of physics in scientific issues and relevant applications, including the impact these could make on the environment/society
- extend and apply knowledge, understanding and skills of physics
- develop and apply the skills to carry out complex practical scientific activities, including the use of risk assessments, technology, equipment and materials
- develop and apply scientific inquiry and investigative skills, including planning and experimental design
- develop and apply analytical thinking skills, including critical evaluation of experimental procedures in a physics context
- extend and apply problem solving skills in a physics context
- further develop an understanding of scientific literacy using a wide range of resources in order to communicate complex ideas and issues and to make scientifically informed choices
- extend and apply skills of independent/autonomous working in physics

An experimental and investigative approach is used to develop knowledge and understanding of physics concepts. The Course develops learners' curiosity, interest and enthusiasm for physics in a range of contexts. The key skills of scientific inquiry and investigation are integrated and developed throughout the Course.

The Course gives opportunities for learners to make reasoned evaluations. It also serves to equip all learners with an understanding of the impact of physics on everyday life, and with the knowledge and skills to be able to reflect critically on scientific publications and media reports. This allows learners to make their own reasoned decisions on many issues within a modern society where the body of scientific knowledge and its applications and implications are ever-developing.

The Course content has been selected to allow learners to study key physics ideas within situations of personal relevance, using up-to-date contexts. The Course offers opportunities for collaborative and independent learning, set within familiar and unfamiliar contexts and for high-quality experimental work.

Information about typical learners who might do the Course

The Course is suitable for learners who are secure in their learning in Higher Physics and Higher Mathematics or equivalent qualifications. Learners will describe and interpret physical phenomena using mathematical modelling skills including trigonometry and calculus, and will practise scientific methods of investigation from which general relationships are derived and explored.

Practical and experiential learning opportunities are emphasised throughout the Course, with a strong skills-based approach to learning. It takes account of the needs of all learners, and provides sufficient flexibility to enable learners to achieve in different ways.

The Course will provide opportunities for learners to develop knowledge and skills in physics, including those that directly relate to everyday life. The development of thinking skills, inquiry and investigative skills, and problem-solving and practical skills, is fundamental to the Course.

Literacy is developed as reading and interpreting scientific literature is encouraged. Learners will be given opportunities to develop scientific ideas and opinions in a coherent logical manner.

The Course encourages independent learning and allows learners to make connections between science and the world in which they live, learn and work. Learners will develop transferable skills and be better prepared for future study and/or employment. Due to the interdisciplinary nature of the sciences, learners will benefit from studying Physics along with Mathematics and Chemistry/Biology/Engineering Science, as this will provide a strong base for further study or employment.

On successful completion of this Course, learners could progress to:

- HND/degree programmes in a physics-based course or a related area, such as engineering, electronics, computing, design, architecture or medicine
- careers in a physics-based discipline or related area, or in a wide range of other areas, such as oil and gas exploration, renewable energy, construction, transport or telecommunications

As well as providing an excellent grounding for the future study of physics and physics-related subjects, the Course also equips all learners with an understanding of the positive impact of physics on everyday life.

Other learners may choose this Course because they have a particular interest in the subject and wish to take the opportunity of studying it in depth.

Course structure and conditions of award

Course structure

Units are statements of standards for assessment and not programmes of learning and teaching. They can be delivered in a number of ways. Units can be taught sequentially or in parallel. However, learning and teaching approaches should provide opportunities to integrate skills, where possible.

Physics: Rotational Motion and Astrophysics (Advanced Higher)
This Unit develops knowledge and understanding and skills in physics related to rotational motion and astrophysics. It provides opportunities to develop and apply concepts and principles in a wide variety of situations involving angular motion. An astronomical perspective is developed through a study of gravitation, leading to work on general relativity and stellar physics.

Physics: Quanta and Waves (Advanced Higher)
This Unit develops knowledge and understanding and skills in physics related to quanta and waves. It provides opportunities to develop and apply concepts and principles in a wide variety of situations involving quantum theory and waves. The Unit introduces non-classical physics and considers the origin and composition of cosmic radiation. Simple harmonic motion is introduced and work on wave theory is developed.

Physics: Electromagnetism (Advanced Higher)
This Unit develops knowledge and understanding and skills in physics related to electromagnetism. It provides opportunities to develop and apply concepts and principles in a wide variety of situations involving electromagnetism. The Unit develops knowledge and understanding of electric and magnetic fields and capacitors and inductors used in d.c. and a.c. circuits.

Investigating Physics (Advanced Higher)
In this Unit, learners will develop key investigative skills. The Unit offers opportunities for independent learning set within the context of experimental physics. Learners will identify, research, plan and carry out a physics investigation of their choice.

Conditions of award

To gain the award of the Course, the learner must pass all of the Units as well as the Course assessment. The required Units are shown in the Course outline section. Course assessment will provide the basis for grading attainment in the Course award.

Skills, knowledge and understanding

Further information on the assessment of skills, knowledge and understanding for the Course is given in the *Course Assessment Specification*. A broad overview of the mandatory subject skills, knowledge and understanding that will be assessed in the Course is given in this section.

This includes:

- extending and applying knowledge of physics to new situations, interpreting and analysing information to solve ~~more~~ complex problems
- planning and designing physics experiments/investigations, using reference material and including risk assessments, to test a hypothesis or to illustrate particular effects
- carrying out complex experiments in physics safely, recording systematic detailed observations and collecting data
- selecting information ~~and~~ from a variety of sources and presenting detailed information, ~~information~~ appropriately, in a variety of forms
- processing and analysing physics information/data (using calculations, significant figures and units, where appropriate)
- making reasoned predictions from a range of evidence/information
- drawing valid conclusions and giving explanations supported by evidence/justification
- critically evaluating experimental procedures by identifying sources of uncertainty, suggesting and implementing improvements
- drawing on knowledge and understanding of physics to make accurate statements, describe complex information, provide detailed explanations and integrate knowledge
- communicating physics findings/information fully and effectively
- analysing and evaluating scientific publications and media reports

Skills, knowledge and understanding to be included in the Course will be appropriate to the SCQF level of the Course. The SCQF level descriptors give further information on characteristics and expected performance at each SCQF level (www.sqa.org.uk/scqf).

Assessment

Information about assessment for the Course is included in the *Course Assessment Specification*, which provides full details including advice on how a learner's overall attainment for the Course will be determined.

Unit assessment

All Units are internally assessed against the requirements shown in the *Unit Specification.*

They can be assessed on an individual basis or by using other approaches which combine the assessment for more than one Unit. ~~Unit-by-Unit basis or by combined assessment.~~

They will be assessed on a pass/fail basis within centres. SQA will provide rigorous external quality assurance, including external verification, to ensure assessment judgments are consistent and meet national standards.

The assessment of the Units in this Course will be as follows.

Physics: Rotational Motion and Astrophysics (Advanced Higher)
Learners who complete the Unit will be able to:

- apply skills of scientific inquiry and draw on knowledge and understanding of the key areas of this Unit to carry out an experiment/practical investigation
- draw on knowledge and understanding of the key areas of this Unit and apply scientific skills

Physics: Quanta and Waves (Advanced Higher)
Learners who complete the Unit will be able to:

- apply skills of scientific inquiry and draw on knowledge and understanding of the key areas of this Unit to carry out an experiment/practical investigation
- draw on knowledge and understanding of the key areas of this Unit and apply scientific skills

Physics: Electromagnetism (Advanced Higher)
Learners who complete the Unit will be able to:

- apply skills of scientific inquiry and draw on knowledge and understanding of the key areas of this Unit to carry out an experiment/practical investigation
- draw on knowledge and understanding of the key areas of this Unit and apply scientific skills

Investigating Physics (Advanced Higher)
Learners who complete the Unit will be able to:

- apply skills of scientific inquiry and draw on knowledge and understanding to research, plan and carry out investigative practical work on a chosen physics topic

Exemplification of possible approaches to assessment for these Units is provided in ~~the National~~ Unit Assessment ~~Resource~~Support.

Course assessment

Courses from National 4 to Advanced Higher include assessment of added value[1]. At National 5, Higher and Advanced Higher, the added value will be assessed in the Course assessment. The added value for the Course must address the key purposes and aims of the Course, as defined in the Course rationale. It will do this by addressing one or more of breadth, challenge and application.

In the Advanced Higher Physics Course, added value will focus on:

- breadth
- challenge
- application

Learners will draw on, extend and apply the skills they have learned during the Course. This will be assessed within a question paper[2] and project[3], requiring demonstration of the knowledge, skills and understanding acquired from across the Units and how they can be applied in unfamiliar contexts and/or integrated ways.

[1] Definitions can be found here: www.sqa.org.uk/sqa/58409.html

[2] See link above for definitions.

[3] See link above for definitions.

Development of skills for learning, skills for life and skills for work

It is expected that learners will develop broad, generic skills through this Course. The skills that learners will be expected to improve on and develop through the Course are based on SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work* and drawn from the main skills areas listed below. These must be built into the Course where there are appropriate opportunities.

1 Literacy

1.1 Reading
1.2 Writing

2 Numeracy

2.1 Number processes
2.2 Money, time and measurement
2.3 Information handling

5 Thinking skills

5.3 Applying
5.4 Analysing and evaluating
5.5 Creating

Amplification of these skills is given in SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work*. The level of these skills will be appropriate to the level of the Course. Further information on building in skills for learning, skills for life and skills for work for the Course is given in the *Course Support Notes*.

Administrative information

Published: April 2015~~3~~ (version 1.0)

History of changes to National Course Specification

Course details	Version	Description of change	Authorised by	Date
	1.1	Minor changes to Aims and Skills and Unit Outcomes	Qualifications Development Manager	April 2015