University of the West of Scotland
Undergraduate Programme Specification

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Named Award Title:	**BSc (Hons) Physics (Sandwich Available) Single**
Award Title for Each Award:	**BSc (Hons) Physics (Sandwich Available)** **BSc Physics** **Dip HE Science** **Cert HE Science**
Date of Validation:	December 2015
Details of Cohorts Applies to:	All those continuing and entering from Sept 2017 onwards

Awarding Institution/Body:	University of the West of Scotland
Teaching Institution:	University of the West of Scotland
Language of Instruction & Examination:	English
Award Accredited By:	Institute of Physics
Maximum Period of Registration:	6 Years Full-time, 8 Years Part-time
Mode of Study:	Full Time Part Time
Campus:	Paisley
School:	School of Computing, Engineering and Physical Sciences
Programme Board	Physical Sciences
Programme Leader:	Gregory V Morozov

Admission Criteria
Candidates must be able to satisfy the general admission requirements of the University of the West of Scotland as specified in Chapter 2 of the University Regulatory Framework together with the following programme requirements:
SQA National Qualifications
BBBC at Higher including Mathematics and Physics OR
BBBC at Higher including Mathematics at B grade and National 5 Physics at B grade
CCD at Advanced Higher including Mathematics and Physics for direct entry to Year 2

or GCE
CC at A Level including Mathematics and Physics OR
BCC at A Level including Mathematics and Physics for direct entry to Year 2

or SQA National Qualifications/Edexcel Foundation
SQA HNC (Grade A)/BTEC Level 4 HNC in Physics, Applied Sciences or a relevant discipline

Other Required Qualifications/Experience
Year 1:
International Baccalaureate (IB) Diploma: 24 points (4, 4 at HL)
Year 2 (direct entry):
International Baccalaureate (IB) Diploma: 28 points

Applicants may also be considered with other academic, vocational or professional qualifications deemed to be equivalent.

Further desirable skills pre-application

General Overview
The BSc (Hons) Physics with Sandwich degree programme at Paisley presents a unique opportunity for the interested student to study one of the most fundamental and instrumental sciences of the 21st century at our new institution in conjunction with undertaking a one year subject related work placement. Physics (=Greek for Nature) is defined as experimental science dealing with matter, space and time via fundamental concepts of force, energy, mass and charge. Primarily focused on applied aspects at the interface of physics and technology, the individual modules incorporate the delivery of physics fundamentals and research underpinned, advanced methodologies, reflecting the high level of expertise of the physics staff. This very distinct selection of modules meets the expectations of the QAA's framework document and related criteria set out by the Institute of Physics (IoP), which in 2015 renewed our accreditation. The QAA document states: "Honours degrees should be awarded to students who have demonstrated: (1) A basic knowledge and understanding of physical laws and principles, and some application of these principles; (2) An ability to identify relevant principles and laws when dealing with problems; (3) The ability to execute and analyse the results of an experiment or investigation." The programme offers the students all these criteria via a very specifically tailored selection of modules that are not only benchmarked towards IoP criteria and modern topics in physics research, but also on industry demands.
The programme includes in the first two years an intense study of the core physics and mathematics, including Introductory Physiscs A, B, Skills for Physics, Mathematics of Space and Change 1, 2, Classical Mechanics, Relativity, Properties of Matter, Oscillations, Waves, Fields, Optics, Electronics, Mathematics for Physicists 1, 2. In addition, the students can chose one optional module in the first year of their studies. The third and fourth year include more advanced Physic topics: Electromagnetism, Quantum Mechanics, Atomic, Nuclear & Particle Physics, Statistical Physics, Solid State Physics. In addition, modules such as Mathematics for Physicists 3, Complex Analysis, Imaging and Nuclear Medicine, Advanced Optics, Applications of Nuclear Physics, Partial Differential Equations, Surface Analysis and Detectors are offered as optional modules. Also, In the final year the student is allowed to perform an independent study project in one of the research groups with international recognition. Besides this very research related feature of the delivery, another distinctive feature of the programme is that students should be able to gain a high degree of independence throughout their studies. As such all modules promote the evaluation of obtained results and their comparison with expected outcomes, theoretical predictions or published data. The delivery of the programme is done via traditional lectures and laboratories. Small size tutorial classes are used to unfold learning outcomes in detail and allow a pronounced staff/student dialogue. After graduation the student will be able to pursue his scientific career in the form of MSc or PhD projects, some of which are likely to be provided by the University. Furthermore the student may start a career in industry. Likely jobs include: Science Teacher, Middle to Senior Management in science focussed industry, the health sector (NHS) and any research and development orientated jobs in the local and international operating high-tech companies. The student may end up in a professional field related to his/her minor subject area. Here it is likely that the physics knowledge will allow the graduate to gain a competitive edge with respect to the current market demands, especially as a successful undertaking of the Sandwich placement would prim him/her for technological work environments.

Graduate Attributes, Employability & Personal Development Planning

Employability skills can be summarized as: High level of technological expertise geared towards problem solving and project progress, numeracy, literacy, transferable skills with regard to computer use, project leadership, team work and management of peers, dissemination of scientific results.
Sandwich Placement
The employability skills and attributes which Students will gain experience in developing, applying and reflecting upon during the sandwich placement will be those identified by The Council for Industry and Higher Education (CIHE) (2006) as the key competencies which employers value as defined below.
• **Cognitive Skills** (attention to detail, analysis and judgement)
* Demonstrate the use of their knowledge, understanding the skills, in both identifying and analysing problems and issues and formulating, evaluations and applying evidence-based solutions and arguments.
* Undertake critical analysis, evaluation and/or synthesis of ideas, concepts information and issued.
* Identify and analyse routine professional problems and issues
* Draw on a range of sources in making judgements
• **Generic competencies** (planning & organisation, influencing, written communication, questioning, listening, teamworking, interpersonal sensitivity, organisation sensitivity and lifelong learning and development)
* Well developed skills for the gathering, evaluation, analysis and presentation of information, ideas, concepts and quantitative and/or qualitative data, drawing on a wide range of current sources. This will include the use of ICT as appropriate to the subject.
* Communication of the results of their own and other work accurately and reliably in a range of different contents using the main specialist concepts, constructs and techniques of the subject.
* Identifying and addressing their own learning needs including being able to draw on a range of current research, development and professional materials.
* Interpreting, using and evaluating numerical and graphical data to achieve goals targets.
* Making formal and informal presentations on standard/mainstream topics in the subject/discipline to a range of audiences.
* Work under guidance with qualified practitioners
* Practice in ways which take account of own and others' roles and responsibilities
* Take some responsibility for the work or others and for a range of resources.
• **Personal capabilities** (creativity, decisiveness, initiative, adaptability/flexibility, achievement orientation, tolerance for stress and
leadership)
*Application of their subject and transferable skills to contexts where criteria for decisions and the scope of the task may be well defined but where personal responsibility, initiative and decision-making is also required. *Exercising autonomy and initiative in some activities at a professional level.
• **Technical Ability** (knowledge of key trends in modern technology and experience of using modern technology) *Use of a range of IT applications to support and enhance work.
• **Practical and professional elements** (professional expertise, process operation and
image) *Show familiarity and competence in the use of routine materials, practices and skills and of a few that are more specialised, advanced and complex.
*Practise in a range of professional level contexts which include a degree of unpredictability.
*Deal with ethical and professional issued in accordance with current professional and/or ethical codes or practices, seeking guidance where appropriate.

We have defined a set of Graduate Attributes that are the skills, personal qualities and understanding to be developed through your university experience that will prepare for life and work in the 21st century (https://www.uws.ac.uk/current-students/your-graduate-attributes/). The Graduate Attributes relevant to this course are listed below.

Academic: critical thinker; analytical; inquiring; knowledgeable; digitally literate; problem solver; autonomous; incisive; innovative

Personal: effective communicator; influential; motivated

Professional: collaborative; research-minded; enterprising; ambitious; driven

Work Based Learning/Placement Details

Student will have the opportunity for a one year placement in industry or a research institution in the UK or Europe. The Physics staff are happy to initiate contacts with known providers of sandwich placements. Details will depend on the chosen project.
The sandwich placement is designed for students to gain and reflect on work experience attained during their time in the workplace. The experience may also contribute towards meeting the membership requirements of a Professional body. Students undertaking a sandwich placement are required to undertake PDP and maintain a portfolio from which they will be required to produce a comprehensive learning log report charting their development during placement. This is assessed on a pass/fail basis only with the majority of ongoing assessment being formative in nature. The student will be required, through reflection, to explore their own role within their placement organisation and to take account of the roles and responsibilities of themselves and others in the context of the structure in which they operate. On successful completion of the placement, the learner will be more employable as a result of having developed their ability to integrate essential generic skills and attributes with subject/discipline related knowledge.
The placement will be governed by a tripartite learning agreement between the student, placement provider and the University which defines the learning outcomes and confirms elements of support and commitment from all parties. The agreement will be signed by each party prior to the start of the placement and it is expected that Schools will continue to use their existing placement systems for the management of such agreements.
Learning Outcomes
At the end of the placement the student will be able to:

• L1 Critically relate elements of the placement work experience to the main themes and issues of academic student of physics relevant within the workplace and be confident in articulating this to others.
• L2 Analyse organisational cultures and structures with particular relevance to the current workplace and exhibit the ability to critically evaluate employee roles in an applied setting.
• L3 Recognise, critically assess and be able to clearly demonstrate to others the personal development and application of essential employability skills and attributes within a real work situation.
Assessment
Assessment will be based on pass/fail only and all assessment elements must be passed for progression as part of the Sandwich programme. Assignments will be open to external examiner in accordance with University regulations.
In order to submit for assessment students need to:
• Attend the workplace(s) in which they have been placed for a minimum total of 36 weeks (180 full working days) and have their employer(s) confirm their attendance.
• Receive a satisfactory assessment of work performance from their workplace supervisor(s) and academic tutor (based on two interviews and other evidence as required).
• Maintain a PDP portfolio and use this to submit a satisfactory learning log report reflecting on the placement experience (minimum 2,000 words).
• Successfully complete a subject related project (minimum 3,000 words or equivalent).
Where a student's sandwich placement is made up of two separate planned period of work experience (ie a "Thin Sandwich"), the PDP portfolio report and subject related report will normally be submitted and assessed during the second period of placement.
Assessment of the first period of placement will relate to satisfactory performance in the workplace. Mitigating circumstances will be taken into consideration in accordance with University regulations.

Reassessment
• Minimum period in work: It is essential that the student completes at least 36 weeks (180 working days) in employment. If the student does not meet this minimum requirement then they cannot pass the placement.
• Catch up: Where through no fault of their own a student has been unable to attain at least 36 weeks placement experience they will be entitled to secure the additional work experience required through a suitable additional period of work experience provided this is agreed in advance with the Programme Team.
• Retake of Placement: a repeat or alternative placement will only be considered on health or other mitigating grounds or where the placement is terminated due to no fault of the student. In such cases the student will receive counselling from the placement tutor on how best to proceed.
• Satisfactory Performance: The first interview will be used to assess the student's progress. If it is considered that the student's performance is less than expected at that stage, the student will be advised

of this and of the elements of their performance that need to improve. If the student's performance is assessed as unsatisfactory at the second interview then the student will be given further advice on the steps they need to take to achieve a satisfactory assessment and will be reassessed through a third interview at the end of their placement period. Interviews will normally be conducted within the workplace unless a suitable alternative method is agreed by all parties. • Reflective Report from PDP: If the reflective report is unsatisfactory, the student will be given the opportunity to resubmit in line with University regulations. • Subject related report: If the subject related report is unsatisfactory the student will be given the opportunity to resubmit in line with University regulations. Progression/Award • Placement students will be assigned to a specific Subject and Programme Panel. • The relevant Programme Panel will consider the performance of each sandwich placement student enrolled on that Programme and decide eligibility for reassessment, progression and awards in accordance with University Regulations, in particular Regulation 7.10.4 • A student who fails the sandwich placement after reassessment will no longer be eligible for a "with sandwich" award. They will either progress to level 9 or 10 (as appropriate) of a non-sandwich equivalent programme or exit with an equivalent non-sandwich award.
Engagement
In line with the Academic Engagement Procedure, Students are defined as academically engaged if they are regularly engaged with timetabled teaching sessions, course-related learning resources including those in the Library and on the relevant learning platform, and complete assessments and submit these on time.
Equality and Diversity
Further information on the institutional approach to Equality, Diversity and Inclusion can be accessed at the following link: https://www.uws.ac.uk/about-uws/uws-commitments/equality-diversity-inclusion/

Programme structures and requirements, SCQF level, term, module name and code, credits and awards (Chapter 1, Regulatory Framework)

A. Learning Outcomes (Maximum of 5 per heading)

Outcomes should incorporate those applicable in the relevant QAA Benchmark statements

Knowledge and Understanding	
A1	Demonstrate a broad general knowledge of the physics topics covered (Mechanics, Electromagnetism, Waves, Heat, Gravitation, and core Maths)
A2	To apply knowledge and understanding to solve relevant numerical and non-numerical problems
A3	Record simple experimental procedures in individual work
Practice - Applied Knowledge and Understanding	
B1	Use the skills of observation, recording of measurements and problem solving in both theoretical and practical situations
B2	Use skills to plan and perform small scientific projects in the laboratory
B3	Use some of the basic and routine professional skills, techniques and practices

Communication, ICT and Numeracy Skills	
C1	Use a range of forms of communication, both spoken and written
C2	Use graphical and numerical skills in combination
C3	Be able to summarise and present scientific individual work effort for critical peer evaluation
Generic Cognitive Skills - Problem Solving, Analysis, Evaluation	
D1	Use a range of approaches to address problems in a routine context within physics
D2	Critical analysis of obtained experimental data
D3	Present and evaluate arguments, information and ideas in physics
D4	Use a range of numerical and graphical skills in combination
Autonomy, Accountability and Working With Others	
E1	Exercise initiative and independence in practical situations
E2	Work in partnership with others in practical classes, taking account of each other's roles and responsibilities
E3	Work with others in support of current professional practise under tutorial guidance

Core Modules

SCQF Level	Module Code	Module Name	Credit	Term			Footnotes
				1	2	3	
7	PHYS07006	Introductory Physics A	20	✓			
7	MATH07003	Mathematics of Space & Change	20	✓			
7	PHYS07005	Skills for Physics	20	✓	✓		
7	PHYS07007	Introductory Physics B	20		✓		
7	MATH07009	Mathematics of Space & Change 2	20		✓		
7	APPD07001	ASPIRE	20	✓	✓		

* Indicates that module descriptor is not published.

Footnotes

Optional Modules

SCQF Level	Module Code	Module Name	Credit	Term			Footnotes
				1	2	3	

* Indicates that module descriptor is not published.

Footnotes

Criteria for Progression and Award

Progression to level SCQF 8 is available to students who fulfil the university progression requirements and who have obtained at least a C pass in each of the core modules at SCQF 7.

A student may exit with an award of Cert HE Science, with a minimum of 120 credit points.

B. Learning Outcomes (Maximum of 5 per heading)

Outcomes should incorporate those applicable in the relevant QAA Benchmark statements

Knowledge and Understanding	
A1	Demonstrate a broad knowledge of physics at the appropriate level, with detailed knowledge in some areas
A2	Demonstrate understanding of a limited range of core theories, principles and concepts
Practice - Applied Knowledge and Understanding	
B1	Carry out routine investigations in a lab situation
B2	Adapt routine practices within accepted standards
Communication, ICT and Numeracy Skills	
C1	Convey complex information on a topic to an audience
C2	Use a range of applications to obtain, process and interpret data
Generic Cognitive Skills - Problem Solving, Analysis, Evaluation	
D1	Understanding core issues of depicted physics problems
D2	Solving of smaller scale theoretical and hand-on laboratory work problems
Autonomy, Accountability and Working With Others	
E1	Work in close partnership with peers on problems

Core Modules

SCQF Level	Module Code	Module Name	Credit	Term			Footnotes
				1	2	3	
8	PHYS08007	Classical Mechanics and Special Relativity	20	✓			
8	PHYS08006	Mathematics for Physicists	20	✓			

8	PHYS08008	Mathematics for Physicists 2	20		✓		
8	PHYS08002	Optics & Electronics	20	✓			
8	PHYS08003	Oscillations, Waves & Fields	20		✓		
8	PHYS08004	Properties of Matter	20		✓		

* Indicates that module descriptor is not published.

Footnotes

Optional Modules

SCQF Level	Module Code	Module Name	Credit	Term			Footnotes
				1	2	3	

* Indicates that module descriptor is not published.

Footnotes

Criteria for Progression and Award

Progression to level SCQF 9 is available to students who fulfil the university progression requirements and who have obtained at least a C pass in each of the core modules at SCQF 8. A student may exit with award Dip. HE Science, with a minimum of 240 credit points.

C. Learning Outcomes (Maximum of 5 per heading)

Outcomes should incorporate those applicable in the relevant QAA Benchmark statements

Knowledge and Understanding	
A1	Demonstrate a broad and integrated knowledge and understanding of the main areas of physics (Atomic, Nuclear, Particle, Solid State, Electromagnetism)
A2	Demonstrate a critical evaluation of modern day physics knowledge
Practice - Applied Knowledge and Understanding	
B1	Practise routine methods of enquiry in a lab setting, including topics with a degree of unpredictability
B2	Use information retrieval system present at the university for further reading and understanding of modern day physics concepts
B3	Discuss outcomes in detail with peers and supervisors
Communication, ICT and Numeracy Skills	
C1	Write formal reports which include elements of interpretation and evaluation of numerical data
C2	Be able to make a formal presentation on a topic as a member of a group
C3	Be able to lead own project

Generic Cognitive Skills - Problem Solving, Analysis, Evaluation	
D1	Undertake critical analysis; evaluate information and synthesise ideas
D2	Benchmark own findings with standard results as depicted in modern day physics
D3	Critical evaluate sources of uncertainties and limits of modern day physics understanding
Autonomy, Accountability and Working With Others	
E1	Exercise autonomy and initiative in practical classes and in intermediate problem solving exercises
E2	Work with others in a group to produce a presentation of intermediate level

Core Modules

SCQF Level	Module Code	Module Name	Credit	Term			Footnotes
				1	2	3	
9	PHYS09011	Atoms & Nuclei	20		✓		
9	PHYS09003	Electromagnetism	20	✓			
9	PHYS09008	Quantum Mechanics	20	✓			
9	PHYS09007	Thermodynamics & Statistical Physics	20		✓		

* Indicates that module descriptor is not published.

Footnotes

Optional Modules

SCQF Level	Module Code	Module Name	Credit	Term			Footnotes
				1	2	3	
9	PHYS09012	Mathematics for Physicists 3	20	✓			
		Any other 20-credit Level 8/9/10 Module					Term 1
9	PHYS09001	Advanced Optics	20		✓		
9	PHYS09009	Imaging & Nuclear Medicine	20		✓		
		Any other 20-credit Level 8/9/10 Module					Term 2

* Indicates that module descriptor is not published.

Footnotes

Criteria for Progression and Award

Progression to level SCQF 10 is available to students who fulfil the university progression requirements and who have obtained at least a C pass in each of the core modules at SCQF 9. Students may, subject to availability, be able to undertake a sandwich placement for one academic year, before proceeding to SCQF level 10.

D. Learning Outcomes (Maximum of 5 per heading)

Outcomes should incorporate those applicable in the relevant QAA Benchmark statements

Knowledge and Understanding	
A1	Demonstrate knowledge that integrates the principle topics in advanced physics at the required level (project, advanced topics in experimental and theoretical physics)
A2	Demonstrate a detailed knowledge and understanding of at least one specialism
Practice - Applied Knowledge and Understanding	
B1	Execute a defined project of research or investigation and identify relevant outcomes
B2	Use a range of skills and practices associated with a specialist area of study
Communication, ICT and Numeracy Skills	
C1	Make a formal presentation on a specialised topic to an informed audience
C2	Be able to defend own project results under peer scrutiny
C3	Be able to communicate with peers and senior colleagues
Generic Cognitive Skills - Problem Solving, Analysis, Evaluation	
D1	Be able to make judgements where data is limited, in a practical or theoretical situation
D2	Critically identify, define and analyse complex physics problems and issues
Autonomy, Accountability and Working With Others	
E1	Exercise autonomy and initiative in practical classes and in advanced problem solving exercises
E2	Work with others in a group to produce a presentation of advanced level

Core Modules

SCQF Level	Module Code	Module Name	Credit	Term			Footnotes
				1	2	3	
10	PHYS10001	Nuclear & Particle Physics	20	✓			
10	PHYS10003	Project & Professional Skills	40	✓	✓		
10	PHYS10009	Solid State Physics	20		✓		

* Indicates that module descriptor is not published.

Footnotes

Optional Modules

SCQF Level	Module Code	Module Name	Credit	Term			Footnotes
				1	2	3	
10	PHYS10005	Surface Analysis & Detectors	20	✓			
10	PHYS10010	Research Topics in Nuclear Physics	20	✓			
10	MATH10003	Partial Differential Equations	20	✓			
		Any other 20-credit Level 9/10 module					Term 1
10	PHYS10012	Applications of Nuclear Physics	20		✓		
10	PHYS10013	Selected Topics in Theoretical Physics	20		✓		
		Any other 20-credit Level 9/10 module					Term 2

* Indicates that module descriptor is not published.

Footnotes

Criteria for Award

Students will exit with an award of BSc (Hons) Physics with a minimum of 480 points. Students who have done a sandwich year will be entitled to BSc (Hons) Physics (Sandwich). Honours degrees are classified in accordance with University regulations

Regulations of Assessment
Candidates will be bound by the general assessment regulations of the University as specified in the University Regulatory Framework. An overview of the assessment details is provided in the Student Handbook and the assessment criteria for each module is provided in the module descriptor which forms part of the module pack issued to students. For further details on assessment please refer to Chapter 3 of the Regulatory Framework. To qualify for an award of the University, students must complete all the programme requirements and must meet the credit minima detailed in Chapter 1 of the Regulatory Framework.
Combined Studies
There may be instances where a student has been unsuccessful in meeting the award criteria for the named award and for other more generic named awards existing within the School. Provided that they have met the credit requirements in line with the SCQF credit minima (please see Regulation 1.21), they will be eligible for an exit award of CertHE / DipHE or BA / BSc in Combined Studies. For students studying BA, BAcc, or BD awards the award will be BA Combined Studies. For students studying BEng or BSc awards, the award will be BSc Combined Studies.

Changes

Changes made to the programme since it was last published:

May 2018

MATH07003 Mathematics of Space and Change moved to Trimester 1.

MATH07002 Sequences & Patterns replaced with MATH07009 Mathematics of

Space and Change 2 (to be taught in Trimester 2).
PHYS08006 Maths for Physicists moved to Trimester 1.
MATH08001 Maths for Design replaced with PHYS08008 Maths for Physicists 2 (to be taught in Trimester 2).
MATH09002 Advanced Calculus replaced with MATH09009 Complex Analysis.
MATH10003 Partial Differential Equations added as an optional module.

May 2019
New optional module Applications of Nuclear Physics included in fourth year.

May 2020
Mathematics for Physicists 2 became a core module;
A new optional module Mathematics for Physicists 3 included in the third year.

July 2022
The core module APPD07001 ASPIRE has been added in place of the recommended optional module PHYS07008 Introductory Astronomy at L7.
The core module PHYS07005 has been converted to a long, thin module with 20 credits over terms 1 and 2.

Level 7 Optional Modules "Introductory Astronomy" and "Engineering Mechanics" removed from the first year.
Level 10 Optional Module "Selected Topics in Theoretical Physics" added in the fourth year.
Version Number: 1.13