Module Descriptor

Title	Modern Physics		
Session	2025/26	**Status**	Published
Code	PHYS08009	**SCQF Level**	8
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	Ryan P. Meeten		

Summary of Module

This is a core SCQF Level 8 module for the Physics programmes presented in the second term.

This module is designed to provide an introduction to special relativity and quantum physics. The syllabus of the module is as follows.

Special Relativity

Definition of inertial reference frames and invariance of the speed of light. The Lorentz transformations and the concepts of time dilation and Lorentz contraction. Twin paradox. Relativistic kinematics and the relativistic Doppler effect. Introduction to Minkowski spacetime and 4-vectors. Momentum and relation to mass and energy as a relativistic property.

Quantum Physics

Blackbody radiation, photoelectric effect, Einstein's photon theory, Rutherford scattering, Bohr-Sommerfeld quantisation condition, Correspondence Principle. Review of wave theory: wave motion, differential equations describing wave motion, amplitude, phase, plane waves, harmonic (monochromatic) waves, phase and group velocities. De Broglie relations between waves and particles, Uncertainty Principle, introduction to the Schrodinger equation, meaning of the wavefunction, probability interpretation. Effects of confinement / physics of bound systems, boundary conditions, quantisation of energy exemplified by square well potential.

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 module are listed below.

• Graduate Attributes - Academic: critical thinker; analytical; inquiring; knowledgeable; digitally literate; problem solver; autonomous; incisive; innovative

• Graduate Attributes - Personal: effective communicator; influential; motivated

• Graduate Attributes - Professional: collaborative; research-minded; enterprising; ambitious; driven

Module Delivery Method	**On-Campus[1]** ☒		**Hybrid[2]** ☐		**Online[3]** ☐		**Work -Based Learning[4]** ☐
Campuses for Module Delivery	☐ Ayr ☐ Dumfries		☐ Lanarkshire ☐ London ☒ Paisley		☐ Online / Distance Learning ☐ Other (specify)		
Terms for Module Delivery	Term 1	☐	Term 2	☒	Term 3	☐	
Long-thin Delivery over more than one Term	Term 1 – Term 2	☐	Term 2 – Term 3	☐	Term 3 – Term 1	☐	

Learning Outcomes	
L1	Appreciate the need for the ideas of modern physics which supersede classical physics.
L2	Develop familiarisation with the ideas of special relativity, including 4-vectors.
L3	Understand the key ideas of quantum physics, such as energy quantisation and wave-particle duality.
L4	Demonstrate fluency with the mathematical skills required of modern physics.
L5	Use Python to explore topics in relativity and quantum physics.

Employability Skills and Personal Development Planning (PDP) Skills	
SCQF Headings	**During completion of this module, there will be an opportunity to achieve core skills in:**
Knowledge and Understanding (K and U)	**SCQF 8** Key ideas in modern physics. Students will be exposed to the counterintuitive concepts of quantum physics and relativity. These ideas will be crucial building blocks for future study of core physics.

[1] Where contact hours are synchronous/ live and take place fully on campus. Campus-based learning is focused on providing an interactive learning experience supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus contact hours will be clearly articulated to students.

[2] The module includes a combination of synchronous/ live on-campus and online learning events. These will be supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus and online contact hours will be clearly articulated to students.

[3] Where all learning is solely delivered by web-based or internet-based technologies and the participants can engage in all learning activities through these means. All required contact hours will be clearly articulated to students.

[4] Learning activities where the main location for the learning experience is in the workplace. All required contact hours, whether online or on campus, will be clearly articulated to students

Practice: Applied Knowledge and Understanding	**SCQF 8** Working at a high level mathematically, and this is an invaluable skill for theoreticians and experimentalists alike.
Generic Cognitive skills	**SCQF 8** Dealing with abstract and challenging mathematical and physical concepts. The mastery of these concepts will develop cognitive abilities expected of physics graduates, such as the ability to be analytical, adaptable, logical and focused.
Communication, ICT and Numeracy Skills	**SCQF 8** Numerical and abstract thinking required of physicists. Communication skills developed while group working in tutorials will also be invaluable.
Autonomy, Accountability and Working with Others	**SCQF 8** Exercising initiative and independence in carrying out defined activities. Taking account of own and others' roles and responsibilities in carrying out and evaluating tasks.

Prerequisites	**Module Code** PHYS07006 PHYS07007 MATH07011 MATH07008 MATH07009	**Module Title** Introductory Physics A Introductory Physics B Applied Mathematics Python Fundamentals Single Variable Calculus
	Other or equivalent	
Co-requisites	**Module Code**	**Module Title**

Learning and Teaching	
In line with current learning and teaching principles, a 20-credit module includes 200 learning hours, normally including a minimum of 36 contact hours and maximum of 48 contact hours.	
Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	**Student Learning Hours** (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture / Core Content Delivery	24
Laboratory / Practical Demonstration / Workshop	24
Independent Study	152
Please select	
Please select	
Please select	
TOTAL	200

Indicative Resources
The following materials form essential underpinning for the module content and ultimately for the learning outcomes: Modern Physics, Kenneth S. Krane (Wiley) Modern Physics, Tipler and Llewellyn (Freeman) Introduction to Quantum Mechanics, D.J. Griffiths and D.F. Schroeter (Cambridge)
(N.B. Although reading lists should include current publications, students are advised (particularly for material marked with an asterisk*) to wait until the start of session for confirmation of the most up-to-date material)

Attendance and Engagement Requirements
In line with the Student Attendance and Engagement Procedure, Students are academically engaged if they are regularly attending and participating in timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time. **For the purposes of this module, academic engagement equates to the following:** The School of Computing, Engineering and Physical Sciences considers attendance and engagement to mean a commitment to attending, and engaging in, timetabled sessions. You will scan your attendance via the scanners each time you are on-campus and you will log in to the VLE several times per week. Where you are unable to attend a timetabled learning session due to illness or other circumstance, you should notify that Programme Leader that you cannot attend. Across the School an 80% attendance threshold is set. If you fall below this, you will be referred to the Student Success Team to see how we can best support your studies.

Equality and Diversity
The University's Equality, Diversity and Human Rights Procedure can be accessed at the following link: UWS Equality, Diversity and Human Rights Code. Aligned with the University's commitment to equality and diversity, this module supports equality of opportunity for students from all backgrounds and learning needs. Using the VLE, material will be presented electronically in formats that allow flexible access and manipulation of content. This module complies with University regulations and guidance on inclusive learning and teaching practice. This module has lab-based teaching and as such you are advised to speak to the Module Co-ordinator to ensure that specialist assistive equipment, support provision and adjustment to assessment practice can be put in place, in accordance with the University's policies and regulations.
(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)

Supplemental Information

Divisional Programme Board	**Engineering Physical Sciences**
Overall Assessment Results	☐ **Pass / Fail** ☒ **Graded**
Module Eligible for Compensation	☒ **Yes** ☐ **No** **If this module is eligible for compensation, there may be cases where compensation is not permitted due to**

	programme accreditation requirements. Please check the associated programme specification for details.
School Assessment Board	Mathematics and Physics
Moderator	M. Barbier
External Examiner	H. Boston
Accreditation Details	Institute of Physics (IoP)
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	3.1 Module descriptor amended to conform to the new template format. Python learning outcome added. Prerequisite module titles updated.

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Class Test (60%)
Assessment 2
Coursework: Problem Sets (40%)
Assessment 3
(N.B. (i) Assessment Outcomes Grids for the module (one for each component) can be found below which clearly demonstrate how the learning outcomes of the module will be assessed. (ii) An indicative schedule listing approximate times within the academic calendar when assessment is likely to feature will be provided within the Student Module Handbook.)

Component 1							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Class Test	☒	☒	☒	☒	☐	60	2

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Coursework	☒	☒	☒	☒	☒	40	0

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**

	☐	☐	☐	☐	☐		
Combined total for all components						100%	2 hours

Change Control

What	**When**	**Who**
Moved to new template	22/03/2025	R. Meeten
Python learning outcome added	22/03/2025	R. Meeten
Prerequisite module titles updated	02/04/2025	R. Meeten