

University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Modern Physics			
Code: PHYS08009	SCQF Level: 8 (Scottish Credit and Qualifications Framework)	Credit Points: 20	ECTS: 10 (European Credit Transfer Scheme)
School:	School of Computing, Engineering and Physical Sciences		
Module Co-ordinator:	Ryan P Meeten		
Summary of Module			
This module is a core module at Level 8 on Institute of Physics (IoP) accredited Physics programmes. 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, Compton effect, 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					
Face-To-Face	Blended	Fully Online	HybridC	Hybrid0	Work-Based Learning
☒	☐	☐	☐	☐	☐
See Guidance Note for details.					

Campus(es) for Module Delivery						
The module will normally be offered on the following campuses / or by Distance/Online Learning: (Provided viable student numbers permit) (tick as appropriate)						
Paisley:	Ayr:	Dumfries:	Lanarkshire:	London:	Distance/Online Learning:	Other:
☒	☐	☐	☐	☐	☐	Add name

Term(s) for Module Delivery					
(Provided viable student numbers permit).					
Term 1	☐	Term 2	☒	Term 3	☐

Learning Outcomes: (maximum of 5 statements) These should take cognisance of the SCQF level descriptors and be at the appropriate level for the module. At the end of this module the student will be able to:	
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.

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 Level 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.	
Practice: Applied Knowledge and Understanding	SCQF Level 8 Working at a high level mathematically, and this is an invaluable skill for theoreticians and experimentalists alike.	
Generic Cognitive skills	SCQF Level 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 Level 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 Level 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.	
Pre-requisites:	Before undertaking this module, the student should have undertaken the following:	
	Module Code: PHYS07006 PHYS07007 MATH07003 MATH07009	Module Title: Introductory Physics A Introductory Physics B Applied Mathematics Mathematical Analysis
	Other:	or equivalent
Co-requisites	Module Code:	Module Title:

*Indicates that module descriptor is not published.

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. The lectures for the module will be delivered using the indispensable "chalk and talk" approach. This is the only approach with the fluidity to accommodate the teaching and learning of mathematical ideas which necessarily follow derivations of ideas from first principles. The ability to add notes and clarify points on the fly is crucial to this kind of subject. The tutorial classes will be based on small group working in rooms with whiteboard walls.

Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	Student Learning Hours (Normally totalling 200 hours): (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture/Core Content Delivery	24
Tutorial/Synchronous Support Activity	12
Independent Study	164
	200 Hours Total
**Indicative Resources: (eg. Core text, journals, internet access)	
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.	
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 . Please ensure any specific requirements are detailed in this section. Module Co-ordinators should consider the accessibility of their module for groups with protected characteristics.	
(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 and Physical Sciences
Assessment Results (Pass/Fail)	Yes ☐ No ☒
School Assessment Board	Physical Sciences
Moderator	Maximilien Barbier
External Examiner	H Boston
Accreditation Details	Institute of Physics (IoP)
Changes/Version Number	2.0 Module descriptor amended to conform to the new template format and to reflect outcomes from ILR 2023.

Assessment: (also refer to Assessment Outcomes Grids below)
Assessment 1 – Class Test (60%)
Assessment 2 – Written Coursework (40%)
(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 (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Class Test	✓	✓	✓	✓	60	2

Component 2						
Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Portfolio of Written Work	✓	✓	✓	✓	40	0
Combined Total for All Components					100	2