Module Descriptor

Title	Solid State Physics		
Session	2025/26	**Status**	Published
Code	PHYS10009	**SCQF Level**	10
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	Shigeng Song		

Summary of Module

This is a core module at SCQF Level 10 for all Physics programmes.

The module covers fundamental concepts of Solid State Physics.

General Syllabus details of the module are as follows.

Crystal structure, lattice, basis, primitive cell, Bravais lattice, Miller indices, reciprocal lattice, x-ray diffraction, Bragg's law, structure factor, production of x-rays, lattice vibrations, Brillouin zones in monatomic and diatomic chains, dispersion, Bose-Einstein distribution, Planck distribution, phonons, Einstein and Debye theory of heat capacities of solids, electrical and thermal conductivities, Hall effect, thermoelectricity, Drude model of metals, electronic specific heat and magnetic susceptibility of metals, quantum free-electron theory of metals, Fermi-Dirac distribution, band theory, metal insulators and semiconductors, band gaps, Fermi energy, intrinsic and extrinsic semiconductors, electron/hole densities, mobility and lifetimes, diffusion and Einstein relations, superconductors, Meissner effect, high temperature superconductivity.

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	Describe and understand simple crystal structures, use the appropriate nomenclature and interpret x-ray diffractograms.
L2	Describe atomic vibrations in crystalline solids, account for heat capacity and solve related problems.
L3	Describe and account for the electronic transport properties of metals, semiconductors and superconductors and solve related problems.
L4	Understand some practical analysis and experimental techniques in solid state physics.
L5	

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 10** Knowledge of core concepts of basic solid state physics. Critical understanding of solid state physics methods. Critical approach towards experimental work at a high level.
Practice: Applied Knowledge and Understanding	**SCQF 10** Use of a selection of skills, techniques and practices applicable to work in the field of solid state physics and enabling further studies (MSc, PhD).

[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 of up-to-date literature search on hot topics in solid state physics.
Generic Cognitive skills	**SCQF 10** Presenting and evaluating arguments, information and ideas in physics. Using a range of approaches to addressing problems and issues in physics.
Communication, ICT and Numeracy Skills	**SCQF 10** Use of computers for advanced study. Literary skills, enabling the communication of abstract concepts in written and verbal forms.
Autonomy, Accountability and Working with Others	**SCQF 10** Taking responsibility for individual studying and retrieval of scientific literature. Presenting results from self-study in front of peers.

Prerequisites	**Module Code** PHYS09003 PHYS09008 PHYS09012 PHYS09013	**Module Title** Electromagnetism Quantum Mechanics Mathematics for Physics 2 Atoms, Nuclei & Particles
	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	36
Tutorial / Synchronous Support Activity	6
Laboratory / Practical Demonstration / Workshop	6
Independent Study	152
Please select	
Please select	
TOTAL	200

Indicative Resources
The following materials form essential underpinning for the module content and ultimately for the learning outcomes: Steven H. Simon, Lecture Notes for Solid State Physics, Oxford University, 2012 Kittel, C., Introduction to Solid State Physics, John Wiley and Sons, 1996 Giuseppe Grosso & Giuseppe Pastori Parravicini, Solid Sate Physics, 2nd ed, 2014
(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 login 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 the 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	Physical Science
Moderator	R. Meeten
External Examiner	TBC
Accreditation Details	Institute of Physics (IoP)
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	3.0 Module descriptor amended to conform to the new template format.

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Class Test (80%)
Assessment 2
Coursework: Problem Sets and Laboratory Work (20%)
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	☒	☒	☒	☐	☐	80	2

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Coursework	☒	☒	☒	☒	☐	20	6

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
	☐	☐	☐	☐	☐		
Combined total for all components						100%	8 hours

Change Control

What	When	Who
Moved to new template	30/03/2025	Shigeng Song
Updated EDI statement	30/03/2025	Shigeng Song
Updated attendance statement	30/03/2025	Shigeng Song