

**University of the West of Scotland  
Module Descriptor**

**Session: 2022/23**

<b>Title of Module: Theory of Thin Films</b>			
<b>Code: PHYS11008</b>	<b>SCQF Level: 11</b> (Scottish Credit and Qualifications Framework)	<b>Credit Points: 10</b>	<b>ECTS: 5</b> (European Credit Transfer Scheme)
<b>School:</b>	School of Computing, Engineering and Physical Sciences		
<b>Module Co-ordinator:</b>	Carlos Garcia		
<b>Summary of Module</b>			
<p>The module offers advanced theoretical study at Level 11 of the physical properties of thin films. It is suitable for all Level 11 students with an undergraduate science/engineering related degree, and is a core module for students enrolled on the Masters in Advanced Thin Film Technologies programme at UWS. The module is intended to teach fundamental physical (mainly optical) properties of thin films. A special emphasis will be given to thin film optics. A brief outline of the syllabus is given below.</p> <ul style="list-style-type: none"> <li>• Optical Properties: Maxwell's equations, Wave Equation, Refractive Index, Extinction Coefficient, Fresnel Formulae, Metals and Dielectrics, Optics of Transparent Films, Multiple Coatings, Transfer Matrix Method</li> <li>• Electrical and Magnetic Properties: Resistance/Resistivity, Metals, Insulators, Discontinuous films, Hall Effect Complications, Magnetoresistance</li> <li>• Use of Special Software (Essential Macleod) to Design Thin Films with Required Optical Parameters</li> <li>• 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 (<a href="https://www.uws.ac.uk/current-students/your-graduate-attributes/">https://www.uws.ac.uk/current-students/your-graduate-attributes/</a>). The Graduate Attributes relevant to this module are listed below.</li> </ul> <ul style="list-style-type: none"> <li>• Graduate Attributes - Academic: critical thinker; analytical; inquiring; knowledgeable; digitally literate; problem solver; autonomous; incisive; innovative</li> <li>• Graduate Attributes - Personal: effective communicator; influential; motivated</li> <li>• Graduate Attributes - Professional: collaborative; research-minded; enterprising; ambitious; driven</li> </ul>			

<b>Module Delivery Method</b>					
<b>Face-To-Face</b>	<b>Blended</b>	<b>Fully Online</b>	<b>HybridC</b>	<b>HybridO</b>	<b>Work-based Learning</b>
	✓				

**Face-To-Face**

Term used to describe the traditional classroom environment where the students and the lecturer meet synchronously in the same room for the whole provision.

**Blended**

A mode of delivery of a module or a programme that involves online and face-to-face delivery of learning, teaching and assessment activities, student support and feedback. A programme may be considered "blended" if it includes a combination of face-to-face, online and blended modules. If an online programme has any compulsory face-to-face and campus elements it must be described as blended with clearly articulated delivery information to manage student expectations

**Fully Online**

Instruction that is solely delivered by web-based or internet-based technologies. This term is used to describe the previously used terms distance learning and e learning.

**HybridC**

Online with mandatory face-to-face learning on Campus

**HybridO**

Online with optional face-to-face learning on Campus

**Work-based Learning**

Learning activities where the main location for the learning experience is in the workplace.

**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)

Paisley:	Ayr:	Dumfries:	Lanarkshire:	London:	Distance/Online Learning:	Other:
✓						

**Term(s) for Module Delivery**

(Provided viable student numbers permit).

Term 1	Term 2	Term 3
	✓	

**Learning Outcomes: (maximum of 5 statements)**

On successful completion of this module the student will be able to:

- L1. Demonstrate a broad knowledge and understanding of the physical properties of thin films.
- L2. Use advanced mathematical concepts to analyse and model the physical properties of thin films.
- L3. Solve problems involving analytical/numerical evaluation of thin film parameters required for particular applications.

**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 11. A broad knowledge of basic theory of thin films with a critical awareness of theoretical issues associated with thin film physics.

Practice: Applied Knowledge and Understanding	SCQF Level 11. Theory of thin films forms the foundation of many technological applications of those films, for example advanced applications in optical displays, piezoelectric based sensors, semiconductor electronics, optoelectronic devices.	
Generic Cognitive skills	SCQF Level 11. Identify, conceptualise and define new, abstract problems and issues in physical science and engineering. Examples include functional thin films for use in optical, electrical, chemical and engineering applications. Develop advanced problem solving skills.	
Communication, ICT and Numeracy Skills	SCQF Level 11. Communication of complex physical ideas using mathematical concepts, with the aid of the software packages.	
Autonomy, Accountability and Working with others	SCQF Level 11. Exercise substantial autonomy and initiative in professional and equivalent activities Take responsibility for your own work i.e. being an independent learner. Communicate effectively with peers, more senior colleagues and specialists.	
<b>Pre-requisites:</b>	Before undertaking this module the student should have undertaken the following:	
	<b>Module Code:</b>	<b>Module Title:</b>
	<b>Other:</b>	
<b>Co-requisites</b>	<b>Module Code:</b>	<b>Module Title:</b>

\* Indicates that module descriptor is not published.

<b>Learning and Teaching</b>	
<b>Learning Activities</b> During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	<b>Student Learning Hours</b> (Normally totalling 200 hours): (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture/Core Content Delivery	12
Tutorial/Synchronous Support Activity	6
Independent Study	82

	100 Hours Total
<b>**Indicative Resources: (eg. Core text, journals, internet access)</b>	
<p>The following materials form essential underpinning for the module content and ultimately for the learning outcomes:</p> <p>M. Ohring, Materials Science of Thin Films, 2nd Edition, 2001</p> <p>H. Angus Macleod, Thin-Film Optical Filters, Fourth Edition, 2010</p> <p>L. Eckertova, Physics of Thin Films, 1977</p>	
<p>(**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)</p>	
<b>Engagement Requirements</b>	
<p>Students are academically engaged if they are regularly engaged with timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time. Please refer to the Academic Engagement and Attendance Procedure at the following link: <a href="#">Academic Engagement and Attendance Procedure</a></p>	

### Supplemental Information

<b>Programme Board</b>	Physical Sciences
<b>Assessment Results (Pass/Fail)</b>	No
<b>Subject Panel</b>	Physical Sciences
<b>Moderator</b>	Des Gibson
<b>External Examiner</b>	D Faux
<b>Accreditation Details</b>	IoP & IET (to be sought when available)
<b>Changes/Version Number</b>	1.08 V2 Summary of the module was updated; exam has been replaced with a class test (more appropriate for 10 credit module)

<b>Assessment: (also refer to Assessment Outcomes Grids below)</b>
50% Assessment Category 2: coursework (homework assignment)
50% Assessment Category 2: coursework (class test)
(N.B. (i) <b>Assessment Outcomes Grids</b> 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 Handbook.)

### Assessment Outcome Grids (Footnote A.)

<b>Component 1</b>					
<b>Assessment Type (Footnote B.)</b>	<b>Learning Outcome (1)</b>	<b>Learning Outcome (2)</b>	<b>Learning Outcome (3)</b>	<b>Weighting (%) of Assessment Element</b>	<b>Timetabled Contact Hours</b>
Class test (written)	✓	✓	✓	50	2
<b>Component 2</b>					
<b>Assessment Type (Footnote B.)</b>	<b>Learning Outcome (1)</b>	<b>Learning Outcome (2)</b>	<b>Learning Outcome (3)</b>	<b>Weighting (%) of Assessment Element</b>	<b>Timetabled Contact Hours</b>
Portfolio of written work	✓	✓	✓	50	0
<b>Combined Total For All Components</b>				100%	2 hours

#### Footnotes

A. Referred to within Assessment Section above

B. Identified in the Learning Outcome Section above

Note(s):

1. More than one assessment method can be used to assess individual learning outcomes.
2. Schools are responsible for determining student contact hours. Please refer to University Policy on contact hours (extract contained within section 10 of the Module Descriptor guidance note).  
This will normally be variable across Schools, dependent on Programmes &/or Professional requirements.

#### Equality and Diversity

The programme team have considered how the programme meets the requirements of potential students irrespective of age, disability, political belief, race, religion or belief, sex, sexual orientation, social background or any other protected characteristic. Students/participants with special needs (including additional learning needs) will be assessed/accommodated and any identified barriers to particular groups of students/participants discussed with the Enabling Support Unit (for further details, please refer

to the UWS Equality, Diversity and Human Rights policy). Further guidance is available from CAPLeD, Student Services, School Disability Co-ordinators or the University's Equality and Diversity Co-ordinator.

[UWS Equality and Diversity Policy](#)

(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)