

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

Session: 2022/23

Title of Module: Thin Film Devices and Applications			
Code: PHYS11013	SCQF Level: 11 (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:	Des Gibson		
Summary of Module			
<p>The module offers advanced study at Level 11 of thin film devices and applications. It is suitable for all Level 11 students with an undergraduate science/engineering related degree and is a core module for students enrolled in the Masters in Advanced Thin Film Technologies programme at the University of the West of Scotland (UWS). The module is intended to cover the <u>design, fabrication, and characterization of electronic devices based on advanced materials with the shape of thin films and nanostructures</u>. In addition, the module also presents various design strategies for thin film devices used in a wide range of applications.</p> <p>Lectures. In the lectures of the module, different examples of thin film based applications will be thoroughly analysed, including electronics (diodes, transistors, logic gates, capacitors, resistors, etc.), optical coatings (anti-reflective coatings, low noise optical coatings for gravitational wave detectors), optics, optoelectronics (photoconductors, photodetectors, photodiodes, phototransistors, etc.), photovoltaics (Si PV cells, bi-facial PV cells, buried contact PV cells, surface texturize PV cells, Heterostructure based PV cells), magnetic devices, photonic devices (lasers, neuromorphic devices) and flexible electronics (e-skin, wearable devices, energy-autonomous devices, etc.).</p> <p>Experimental Lab. Students will undertake a practical investigation of Thin Film Electronic Devices, comprising the design, fabrication, and characterization of a thin film transistor based on amorphous silicon (a-Si).</p> <p>Tutorials. Students will participate in journal clubs, workshops, P activities which will contribute to improving their oral presentation skills and scientific writing aptitudes.</p> <p>The Graduate Attributes relevant to this module are listed below.</p> <ul style="list-style-type: none"> • 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 			

Module Delivery Method					
Face-To-Face	Blended	Fully Online	HybridC	HybridO	Work-based Learning

	✓				
<p>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.</p> <p>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</p> <p>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.</p> <p>HybridC Online with mandatory face-to-face learning on Campus</p> <p>HybridO Online with optional face-to-face learning on Campus</p> <p>Work-based Learning Learning activities where the main location for the learning experience is in the workplace.</p>					

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)
<p>On successful completion of this module the student will be able to:</p> <p>L1. Critical understanding of the design, fabrication and characterization of thin film devices and their applicability in some key technological fields.</p> <p>L2. Understand how the advanced physical principles of functional thin films can be applied to sensor systems, optical components, micro-electromechanical components, decorative surfaces and enabling other technologies.</p> <p>L3. Demonstrate knowledge and understanding of thin film devices and applications by presenting their work to their peers.</p> <p>L4. Understand the contribution of their learning during this module to their knowledge and understanding, professional development, and further study.</p>
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)	<p>SCQF Level 11.</p> <p>SCQF Level 11.</p> <ol style="list-style-type: none"> 1. Knowledge that covers and integrates the main areas of the subject – including features, boundaries, terminology and conventions. 2. A critical understanding of the principal theories, concepts and principles. 3. A critical understanding of a range of specialised theories, concepts and principles. 4. Extensive, detailed and critical knowledge and understanding in one or more specialisms at the forefront. 5. A critical awareness of current issues in a subject/discipline/sector and one or more specialisms.
Practice: Applied Knowledge and Understanding	<p>SCQF Level 11.</p> <p>SCQF Level 11.</p> <ol style="list-style-type: none"> 1. Using a significant range of the principal professional skills, techniques, practices and materials associated with the subject. 2. Using a range of specialised skills, techniques, practices and materials informed by the forefront of research. 3. Applying a range of standard and specialised techniques of enquiry.
Generic Cognitive skills	<p>SCQF Level 11.</p> <p>SCQF Level 11.</p> <ol style="list-style-type: none"> 1. Apply critical analysis, evaluation and synthesis to recent developments in thin film applications. 2. Critically review and consolidate knowledge and skills in thin film applications. 3. Deal with complex issues and make informed judgements in situations in the absence of complete or consistent data/information.
Communication, ICT and Numeracy Skills	<p>SCQF Level 11.</p> <p>SCQF Level 11 specifies use of a wide range of routine skills and a range of advanced and specialised skills:</p> <ol style="list-style-type: none"> 1. Communicate, using appropriate methods, to a range of audiences with different levels of knowledge/expertise. 2. Communicate with peers, more senior colleagues and specialists. 3. Use a wide range of ICT applications to support and enhance work at this level and adjust features to suit purpose. 4. Undertake critical evaluations of a wide range of numerical and graphical data.
Autonomy, Accountability and Working with others	<p>SCQF Level 11.</p> <p>SCQF Level 11.</p> <ol style="list-style-type: none"> 1. Exercise substantial autonomy and initiative in academic and professional activities. 2. Take responsibility for own work and/or significant responsibility for the work of others. 3. Demonstrate initiative and make an identifiable contribution to development and new thinking. 4. Practise in ways which draw on critical reflection on own and others' roles and responsibilities. 5. Manage complex ethical and professional issues.

Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code:	Module Title:
	Other:	None
Co-requisites	Module Code:	Module Title:

* Indicates that module descriptor is not published.

Learning and Teaching	
It is a fundamental expectation at the Masters level that participants are independent learners. The module will thus be taught by a combination of lectures, class-based group-work tutorials, laboratory/practical study including a mini-project and guided independent study.	
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	20
Tutorial/Synchronous Support Activity	10
Laboratory/Practical Demonstration/Workshop	6
Independent Study	164
	200 Hours Total
**Indicative Resources: (eg. Core text, journals, internet access)	
<p>The following materials form essential underpinning for the module content and ultimately for the learning outcomes:</p> <p>Principles of Measurement Systems, John P. Bentley, Pearson Education, 2005.</p> <p>Handbook of thin film devices, Maurice Francombe, Academic Press, 2000.</p> <p>Thin film device applications, Kasturi Chopra, Plenum Press, 1983</p> <p>“Physics of Optoelectronic Devices,” Wiley Series in Pure Applied Optics</p> <p>“Optical Thin Films and Coatings,” From Materials to Applications Woodhead Publishing Series in Electronic and Optical Materials</p> <p>S.D. Brotherton “Introduction to Thin Film Transistors,” Physics and Technology of TFTs, Springer 2013.</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)

Engagement Requirements

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: [Academic Engagement and Attendance Procedure](#)

Supplemental Information

Programme Board	Physical Sciences
Assessment Results (Pass/Fail)	No
Subject Panel	Physical Sciences
Moderator	David Hutson
External Examiner	D Faux
Accreditation Details	
Changes/Version Number	2.03 - Description of the module (Content of the lectures, labs, and tutorials) - Books - Assignments Criteria

Assessment: (also refer to Assessment Outcomes Grids below)

Coursework Assignment 1 (50%). This assessment consists of 2 Class Tests.

Coursework Assignment 2 (50%). This coursework will be divided into two assignments: Experimental Lab (32%) and Tutorials (18%).

Experimental lab. This assessment consists of three Written Lab Reports and a final Oral Presentation, showing the main findings and conclusions obtained during the project developed at the laboratory.

Tutorials. This assessment consists of six journal article revision, a Workshop, and a Peerwise activity.

(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 Handbook.)

Assessment Outcome Grids (Footnote A.)

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 (written)	✓	✓		✓	50	0
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
Case study	✓	✓		✓	4	0
Dissertation/ Project report/ Thesis	✓	✓	✓	✓	24	0
Review/ Article/ Critique/ Paper	✓	✓	✓	✓	10	0
Workbook/ Laboratory notebook/ Diary/ Training log/ Learning log	✓	✓	✓	✓	4	0
Presentation	✓	✓	✓	✓	8	0
Combined Total For All Components					100%	0 hours

Footnotes

A. Referred to within Assessment Section above

B. Identified in the Learning Outcome Section above

<p>Note(s):</p> <ol style="list-style-type: none"> 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
(N.B. Every effort will be made by the University to accommodate any equality, diversity and human rights issues brought to the attention of the School) <u>UWS Equality and Diversity Policy</u>
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