University of the West of Scotland
Module Descriptor

Session: 2023/24

Title of Module: Optics & Electronics			
Code: PHYS08002	**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:	David Hutson		

Summary of Module

This is a module at level 8, core for IoP accredited Physics courses. It would also be suitable for someone with a background in Physics at level 6 (SQA Higher) wishing to extend their knowledge of optics and electronics. The teaching consists of a mix of lectures, tutorials where students can develop their problem solving abilities and practical classes where the theory taught in lectures will be brought to life in a variety of hands-on experiments. A formal lab report for one experiment is to be submitted to demonstrate technical writing skills.
Topics covered will include:
Wave nature of light, Diffraction of light – Fraunhofer and Fresnel conditions and formulae.

Rayleigh resolution criterion.

Malus's law, Brewster's law

Electromagnetic nature of light, polarization,

Optical cavities and laser action.

Optical instruments; Dispersion and Snell's law; Lenses and mirrors – f number and field depth. Ray trace, focal length equation, formation of images. Seidel and chromatic aberrations. Apertures and stops.

Analogue electronics - resistor networks, transistor and operational amplifier circuits.

Digital electronics – binary arithmetic/codes. Component circuits; Boolean algebra and truth tables; Combination logic circuits; Sequential logic circuits

- 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**	**HybridO**	**Work-based Learning**
✓					

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 knowledge and understanding of physical optics and wave theory, the electromagnetic nature of light and the basic principles of laser operation. L2. Demonstrate knowledge of analogue circuits using transistors and operational amplifiers, execute operations in Boolean algebra derived from truth tables and implement using digital circuit components. L3. Demonstrate practical and analytical skills by building and debugging electronic circuits. L4. Demonstrate practical ability in performing, recording and analyzing the results of laboratory experiments

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. Knowledge and understanding of the wave nature of light and the evidence for this, including related lab experiments. Also a basic knowledge of analogue and digital circuits.	
Practice: Applied Knowledge and Understanding	SCQF Level 8. Building electronic circuits and de-bugging them, conducting lab experiments in various areas of simple optics	
Generic Cognitive skills	SCQF Level 8. Interpreting results and drawing conclusions	
Communication, ICT and Numeracy Skills	SCQF Level 8. Problem solving; communicating ideas in words and in writing; calculations associated with the theory	
Autonomy, Accountability and Working with others	SCQF Level 8. Working in pairs in the laboratory; contributing in small group tutorials	
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 Mathematics of Space & Change Mathematics of Space & Change 2
	Other:	or equivalent
Co-requisites	**Module Code:**	**Module Title:**

* Indicates that module descriptor is not published.

Learning and Teaching	
This is a lecture based course, supplemented with laboratory classes and problem solving tutorials. The optics lectures will cover the theory of the wave and electromagnetic nature of light. Simple optical systems and instruments will be discussed in the lectures, and this will be backed up by the practical classes where students will learn to take and record measurements, and to assess the uncertainties in these measurements, comparing results, where appropriate, with accepted values (e.g. the measurement of the wavelength of a particular light source). The lectures in electronics will give an introduction to analogue and digital electronics, this will be reinforced by practical work wiring and troubleshooting simple analogue and digital circuits. In doing this students will also gain skills in written communication by the use of a logbook. A formal lab report is to be submitted for one experiment. The problem solving tutorials will allow the student to reflect on the theory and apply it to suitable numerical problems. Students will be encouraged to work in groups as well as on their own. The face to face teaching will be supplemented by a Moodle site giving students remote access to the teaching materials and other resources such as homework exercises. In addition to face to face contact as outlined above, students will be expected to consolidate their learning by wider reading of the recommended texts, by independent study and by further independent practice at problem solving.	
Learning Activities During completion of this module, the learning activities	**Student Learning Hours** (Normally totalling 200 hours):

undertaken to achieve the module learning outcomes are stated below:	(Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture/Core Content Delivery	24
Tutorial/Synchronous Support Activity	12
Laboratory/Practical Demonstration/Workshop	12
Independent Study	152
	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:
University Physics, Young and Freedman, Addison Wesley 12th Edition (2007)[ISBN: 978-0805321876]

Electronics with Discrete Components, Galvez, John Wiley & Sons (2013), [ISBN: 978-0470889688], (£44).

(**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

In line with the Academic Engagement Procedure, Students are defined as academically engaged if they are regularly engaged with timetabled teaching sessions, course-related learning resources including those in the Library and on the relevant learning platform, and complete assessments and submit these on time. Please refer to the Academic Engagement Procedure at the following link: Academic engagement procedure

Supplemental Information

Programme Board	Physical Sciences
Assessment Results (Pass/Fail)	No
Subject Panel	Physical Sciences
Moderator	Marcus Scheck
External Examiner	H Boston
Accreditation Details	Institute of Physics
Changes/Version Number	2.11 5. Added "A formal lab report for one experiment is to be submitted to demonstrate technical writing skills" 9. Added "A formal report is to be submitted for one experiment" Deleted "Blackboard". Added "Moodle"

	10. Added "including one formal report" 12. Deleted core text "Electrical & Electronic Technology", Hughes. Added core text "Electronics with Discrete Components", Galvez. v5.0 The prerequisites were updated Moderator updated

Assessment: (also refer to Assessment Outcomes Grids below)
There are two categories of assessment: Exam: The examination assesses the taught course (worth 60% of the total assessment mark for the module).
CA: The continual assessment mark (40% of the total assessment mark for the module) consists of the lab performance including a formal lab report (25%) and a written assignment (15%).
(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
Unseen closed book (standard)	✓	✓			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	✓	✓			15	0
Clinical/ Fieldwork/ Practical skills assessment/ Debate/ Interview/ Viva voce/ Oral			✓	✓	25	16
Combined Total For All Components					100%	18 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
An element of lab work is necessary to complete the module. There is no discrimination here. Provision will be made for those with poor eyesight to do alternative optical experiments. Those with poor hearing can use the notes on the whiteboard and the textbooks and handouts. 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)