University of the West of Scotland
Module Descriptor

Session: 2023/24

Title of Module: Oscillations, Waves & Fields			
Code: PHYS08003	**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:	Gregory V Morozov		

Summary of Module

This module is one of six SCQF Level 8 core modules of the B.Sc. programme in Physics/Physics with Nuclear Technology/Physics with Education. The module is normally taken in Year 2 of the programmes. The module covers mechanical and electrical oscillations (including some general aspects of AC circuit theory), fundamentals of wave theory, and the basic concepts of electromagnetic and gravitational fields.
Summary of the covered material is as follows.
1. Mechanical oscillations: simple harmonic motion, amplitude, velocity, equilibrium, spring constant, driven and damped oscillations, resonance, amplitude-frequency and phase-frequency characteristics, coupled oscillators, Lagrange approach to oscillatory systems.
2. Electrical oscillations: AC circuits, Kirchhoff's rules, capacitors, inductors, impedances, series and parallel resonances in AC circuits.
3. Fundamentals of wave theory: wave motion, differential equations describing wave motion, amplitude, phase, plane waves, harmonic (monochromatic) waves, phase and group velocities, Fourier expansion, reflections, energy in waves.
4. Fields: field concepts in electromagnetism and gravitation, conservative fields, central fields, potential energy, Newton's law for gravitation, Gauss's law for gravitational fields, laws of electrodynamics for electrostatic and magnetostatic fields in vacuum, in particular, Coulomb law, Gauss's law for electric fields, Circulation law, Bio-Savart law, Gauss's law for magnetic fields, Amperes circuit law, both integral and differential forms of these laws will be discussed, boundary conditions.

- 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 mechanical and electrical oscillations.
L2. Demonstrate knowledge and understanding of waves in mechanics and theoretical understanding of the field concepts in mechanics and electromagnetism.
L3. Demonstrate knowledge and understanding of differential equations as applied to physical systems.
L4. Demonstrate practical ability in performing, recording and analyzing the results of simple 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 of core concepts of fundamental mathematics and its application on wave and oscillations Demonstrate a critical understanding of simple harmonic motion and its presence in phenomena governing our environment

	Demonstrate a critical approach towards hands-on theoretical and practical problem solving	
Practice: Applied Knowledge and Understanding	SCQF Level 8. Use a selection of mathematical skills, techniques and practices applicable to modern day physics Practice literature searches and experimental methodologies such as uncertainty evaluation Understanding of the concept of waves and fields in modern day physics in general	
Generic Cognitive skills	SCQF Level 8. Critical appreciation of underlying physical concepts, synergies of physical occurrences in different non-related fields Problem analysis, evaluation and solving	
Communication, ICT and Numeracy Skills	SCQF Level 8. Use of calculators and computers Use of modern day scientific database system as present at the university (Athens) Literary skills, enabling the communication of obtained results e.g. lab-report	
Autonomy, Accountability and Working with others	SCQF Level 8. Individual studying and small project management Working towards deadlines and avoiding unnecessary penalties Planning and preparation of laboratory work Team-working abilities, as lab-work is encouraged to be done in groups	
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
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 fundamental physical 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 lecture material will be put into practice in practical laboratory classes. Students are expected to relate the material taught in lectures to the experiments performed in the practical classes. Tutorials (or problems classes) will enable students to further test the material taught in lectures. Generally, problems will be issued by the lecturers before the formal tutorial hours. This will allow students to work on the problems in advance and clarify possible issues/difficulties during the tutorials. Tutorials are thus of great value to the students as they help misunderstandings and conceptual difficulties to be sorted out.

The three coursework assignments are complex exercises which may require private study and further literature research. Thus, in addition to the knowledge and understanding of the course material this module will provide skills development in areas such as independent thought and problem solving.

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
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:
A. P. French, "Vibrations and Waves", CBS Publishers & Distributors, 2003

D. Fleisch and L. Kinnaman, "A Student's Guide to Waves", Cambridge, 2015

D. J. Griffiths, "Introduction to Electrodynamics", Pearson, 4th edition, 2013 (or later)

Young and Freedman, "University Physics", Addison Wesley, 12th Edition, 2007 (or later)

(**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	2.13 v3.0 The prerequisites were updated Module coordinator updated v3.1 Syllabus and recommended textbooks were updated. Syllabus updated.

Assessment: (also refer to Assessment Outcomes Grids below)
60% Assessment Category 1 (final exam)
40% Assessment Category 2 (coursework + laboratory work)
(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
Laboratory/ Clinical/ Field notebook				✓	20	12
Portfolio of written work	✓	✓	✓		20	0

Combined Total For All Components	100%	14 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
Arrangements for students with additional support requirements will be made where possible. 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)