University of the West of Scotland
Module Descriptor

Session: 2023/24

Title of Module: Classical Mechanics			
Code: PHYS08007	**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:	Maximilien Barbier		

Summary of Module

This first part of the module will provide a detailed overview of the ideas of classical mechanics from a Newtonian perspective. The module will begin with a review of Newton's laws and vector manipulations. Non inertial frames will be introduced, and centrifugal and Coriolis forces will be discussed. We will then proceed with a treatment of rigid body dynamics, covering ideas of moment of inertia, torque, angular momentum and Euler angles.

The second part of the module will be a treatment of analytical mechanics focusing on variational principles. We will discuss the Lagrangian and Hamiltonian formalisms including Poisson brackets, generalised coordinates, phase space and the Hamilton-Jacobi equation. We will elucidate the topics of symmetries and conservation laws and describe Noether's Theorem.

Both approaches will then be applied to the study of mechanical oscillations.

The module will be taught using a combination of lectures and tutorials supplemented by laboratory sessions to reinforce the theoretical concepts.

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 classical mechanics including rigid body kinematics and dynamics. L2. Demonstrate knowledge of vector algebra applied to classical mechanics in three dimensions. L3. Demonstrate an appreciation of variational principles and the formalisms of Lagrangian and Hamiltonian mechanics, and recognise where these descriptions are more useful than the Newtonian approach. L4. Demonstrate practical ability in performing laboratory experiments, and recording and analyzing the results, and maintaining a laboratory notebook.

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 vector algebra, matrices, calculus and 3 dimensional co-ordinate systems. *) Demonstrate a critical understanding of underlying theories governing motion in space. *) Knowledge of abstract approaches of analytical mechanics. *) Demonstrate a critical approach towards problem solving.
Practice: Applied Knowledge and Understanding	SCQF Level 8. *) Use a selection of mathematical skills, techniques and practices applicable to modern day physics. *) Confirmation of theoretical models with laboratory experiments.

	*) Practice literature searches and experimental methodologies such as uncertainty evaluation.
Generic Cognitive skills	SCQF Level 8. Critical appreciation of underlying physical concepts. Problem analysis, evaluation and solving.
Communication, ICT and Numeracy Skills	SCQF Level 8. *) Use of calculators and computers. *) 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. *) Team-working abilities, as labwork is encouraged to be done in groups.

Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code: MATH07003 MATH07009	**Module Title:** Calculus A Calculus B
	Other:	or equivalent
Co-requisites	**Module Code:**	**Module Title:**

* Indicates that module descriptor is not published.

Learning and Teaching
The delivery of the module is primarily lecture based, with relevant problems in associated tutorials (problems classes). The tutorials (problem classes) are focused on exercises which address different aspects of classical mechanics. A reading list of relevant books is provided and students are encouraged to use the modern information retrieval systems for further material related to the subject area. Lecture notes will be available on Aula. Students are encouraged to use the Aula communication tools to give feedback on the teaching and taught material and to discuss topics with their peers and teaching staff. As physics is an experimental subject, a series of experiments are performed in the laboratory classes. In the laboratory, students gain hands-on practical experience using state-of-the-art equipment and computer systems for data analysis. A written report (in a laboratory notebook) is submitted for each experiment. It is expected that students will develop their knowledge using self study, which is an important part of all physics modules.

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	24
Laboratory/Practical Demonstration/Workshop	12
Independent Study	140

	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, (2011 or later) An Introduction to Mechanics, Kleppner and Kolenkow, Cambridge University Press (2013 or later) Classical Mechanics of Particles and Rigid Bodies, Kiran Gupta, Wiley (1988 or later) Course of Theoretical Physics (Vol 1): Mechanics, Landau & Lifshitz, Elsevier (2003 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	Ryan Meeten
External Examiner	H Boston
Accreditation Details	Institute of Physics
Changes/Version Number	1.14 Title of the module changed. Module Coordinator and Moderator changed. Summary/contents revised: in particular, the relativity part of the previous version was removed, and Analytical Mechanics part was extended to make the module more suitable for students in Maths programmes.

Assessment: (also refer to Assessment Outcomes Grids below)
On campus class test (written)
Laboratory (four experiments, 3 hours each, write-up and data analysis for each experiment) Two Courseworks

(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)	✓	✓	✓		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

In order for the student to complete this module an element of laboratory work will require to be undertaken. Every effort will be made to accommodate any equality and diversity issues brought to the attention of the School.
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)