Module Descriptor

Title	Mathematics for Physics 1		
Session	2025/26	**Status**	Published
Code	PHYS08006	**SCQF Level**	8
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	Ryan P. Meeten		

Summary of Module

This is a core SCQF Level 8 module for the Physics Programmes presented in the first term.

This module is an essential module for all students of physics. It covers the key mathematical techniques and ideas required for underpinning the mathematical content of other physics modules. Physicists need to be equipped with the mathematical tools for understanding and solving differential equations, manipulating and utilising matrices and applying key ideas of multivariable calculus.

The module will cover first order differential equations, including separating variables and integrating factors. It will also cover second order linear differential equations, including a discussion of homogeneous and inhomogeneous cases with constant and variable coefficients. A brief survey of named differential equations such as the Bernoulli and Riccati equations will be undertaken. Power series and Laplace transform methods will be introduced as alternative approaches.

Key concepts in linear algebra related to the solution of systems of linear equations, matrix operations and eigenvalues and eigenvectors of matrices will be described. We will discuss orthonormal bases and the Gram-Schmidt Process. The ideas of the basis independent quantities of trace and determinant will be explored.

We will explore functions of several variables, including the notion of partial derivatives and total derivatives. We will meet the gradient of a scalar field and describe its geometrical properties. Double integration will be covered in both Cartesian and polar coordinate systems. A treatment of line integrals in the plane and the connection to double integrals via Green's Theorem will follow.

The module will end with a brief overview of the key essentials of probability theory, including moments.

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	**On-Campus**[1] ☒	**Hybrid**[2] ☐	**Online**[3] ☐	**Work -Based Learning**[4] ☐
Campuses for Module Delivery	☐ Ayr ☐ Dumfries	☐ Lanarkshire ☐ London ☒ Paisley	☐ Online / Distance Learning ☐ Other (specify)	

Terms for Module Delivery	Term 1	☒	Term 2	☐	Term 3	☐
Long-thin Delivery over more than one Term	Term 1 – Term 2	☐	Term 2 – Term 3	☐	Term 3 – Term 1	☐

Learning Outcomes	
L1	Classify and solve differential equations using a range of techniques.
L2	Manipulate matrices and work with eigenvalues and eigenvectors.
L3	Understand and apply concepts from differential and integral multivariable calculus.
L4	Apply the essentials of probability theory.
L5	Analyse mathematics concepts using a computer algebra system

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:**

[1] Where contact hours are synchronous/ live and take place fully on campus. Campus-based learning is focused on providing an interactive learning experience supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus contact hours will be clearly articulated to students.

[2] The module includes a combination of synchronous/ live on-campus and online learning events. These will be supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus and online contact hours will be clearly articulated to students.

[3] Where all learning is solely delivered by web-based or internet-based technologies and the participants can engage in all learning activities through these means. All required contact hours will be clearly articulated to students.

[4] Learning activities where the main location for the learning experience is in the workplace. All required contact hours, whether online or on campus, will be clearly articulated to students

Knowledge and Understanding (K and U)	**SCQF 8** Mathematical techniques that are essential for physics, including differential equations, linear algebra and multivariable calculus.
Practice: Applied Knowledge and Understanding	**SCQF 8** Routine mathematical skills and methods tom model and solve physics problems.
Generic Cognitive skills	**SCQF 8** • Performing calculations efficiently and accurately at a level suitable for SCQF Level 8. • Presenting clear and logical arguments.
Communication, ICT and Numeracy Skills	**SCQF 8** • Presenting mathematical arguments in a clear and coherent manner. • A range of numerical and graphical approaches to the solution of differential equations.
Autonomy, Accountability and Working with Others	**SCQF 8** • Group working will encourage collaboration and the demonstration of academic integrity. • Exercising initiative and independence in carrying out defined activities. • Taking account of own and others' roles and responsibilities in carrying out and evaluating tasks.

Prerequisites	**Module Code** PHYS07006 PHYS07007 MATH07011 MATH07008 MATH07009	**Module Title** Introductory Physics A Introductory Physics B Applied Mathematics Python Fundamentals Single Variable Calculus
	Other or equivalent	
Co-requisites	**Module Code**	**Module Title**

Learning and Teaching	
In line with current learning and teaching principles, a 20-credit module includes 200 learning hours, normally including a minimum of 36 contact hours and maximum of 48 contact hours.	
Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	**Student Learning Hours** (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture / Core Content Delivery	24

Laboratory / Practical Demonstration / Workshop	24
Independent Study	152
Please select	
Please select	
Please select	
TOTAL	200

Indicative Resources
The following materials form essential underpinning for the module content and ultimately for the learning outcomes: Riley, Hobson and Bence – "Mathematical Methods for Physics and Engineering: A Comprehensive Guide" (Third Edition)
(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)

Attendance and Engagement Requirements
In line with the Student Attendance and Engagement Procedure, Students are academically engaged if they are regularly attending and participating in timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time. **For the purposes of this module, academic engagement equates to the following:** The School of Computing, Engineering and Physical Sciences considers attendance and engagement to mean a commitment to attending, and engaging in, timetabled sessions. You will scan your attendance via the scanners each time you are on-campus and you will log in to the VLE several times per week. Where you are unable to attend a timetabled learning session due to illness or other circumstance, you should notify that Programme Leader that you cannot attend. Across the School an 80% attendance threshold is set. If you fall below this, you will be referred to the Student Success Team to see how we can best support your studies.

Equality and Diversity
The University's Equality, Diversity and Human Rights Procedure can be accessed at the following link: UWS Equality, Diversity and Human Rights Code. Aligned with the University's commitment to equality and diversity, this module supports equality of opportunity for students from all backgrounds and learning needs. Using the VLE, material will be presented electronically in formats that allow flexible access and manipulation of content. This module complies with University regulations and guidance on inclusive learning and teaching practice. This module has lab-based teaching and as such you are advised to speak to the Module Co-ordinator to ensure that specialist assistive equipment, support provision and adjustment to assessment practice can be put in place, in accordance with the University's policies and regulations.
(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)

Supplemental Information

Divisional Programme Board	**Engineering Physical Sciences**
Overall Assessment Results	☐ **Pass / Fail** ☒ **Graded**
Module Eligible for Compensation	☒ **Yes** ☐ **No** **If this module is eligible for compensation, there may be cases where compensation is not permitted due to programme accreditation requirements. Please check the associated programme specification for details.**
School Assessment Board	Mathematics and Physics
Moderator	G. V. Morozov
External Examiner	M. Gorman
Accreditation Details	Institute of Physics (IoP)
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	3.2 Module descriptor amended to conform to the new template format. Prerequisite module titles updated.

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Class Test (60%)
Assessment 2
Coursework: Problem Sets (40%)
Assessment 3
(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 Module Handbook.)

Component 1							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Class Test	☒	☒	☒	☒	☐	60	2

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Coursework	☒	☒	☒	☒	☒	40	0

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
	☐	☐	☐	☐	☐		
Combined total for all components						100%	2 hours

Change Control

What	When	Who
Moved to new template	22/03/2025	R. Meeten
Prerequisite module titles updated	02/04/2025	R. Meeten