University of the West of Scotland
Module Descriptor

Session: 2022/23

Title of Module: Mathematics for Physicists			
Code: PHYS08006	**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:	Ryan Meeten		

Summary of Module

Since mathematics is the language of nature, it is essential for every physicist to develop an understanding of mathematical concepts and be able to apply them. The approach for this module and its continuation, Mathematics for Physicists 2, differs from the typical formal mathematical style of axiom/proof. In this module, the relevant mathematics is introduced and exercised, with a focus on developing intuition, and on helping students to cultivate their problem solving skills.

The mathematical concepts introduced contain such topics as sequences and series, convergence and divergence criteria, expansion of functions into series (binomial, geometric, Taylor), probability theory and statistics, multivariable calculus, including limits and continuity of multivariate functions. The Nabla operator will be introduced, and used to calculate gradient and directional derivatives of scalar fields. The scalar Laplacian will be introduced. Integration in multiple dimensions and in various coordinate systems will be considered. The module will conlcude with a treatment of both first and second order ordinary differential equations.

The module will emphasise group work tutorials in one of the learning studios, and students will have the opportunity to experience challenging problem solving tasks, allowing them to develop their confidence and fluency with the ideas presented.

- 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. Understand and apply basic mathematical concepts to problems in physics. L2. Safely handle mathematical operations such as differentiating, integrating, or expanding a function in a series. L3. Independently apply mathematical concepts to evaluate and develop mathematical models. L4. Able to develop and validate mathematical and computational models of physical problems

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. Mathematical and computational modelling techniques.
Practice: Applied Knowledge and Understanding	SCQF Level 8. Train and use some basic and routine mathematical skills, techniques, practices and methods to model and solve physics problems.
Generic Cognitive skills	SCQF Level 8. - Analytic approach to physics using mathematics as tool. - Present and evaluate information and ideas in a well documented

	form. - Use a range of approaches to addressing problems and issues in physics	
Communication, ICT and Numeracy Skills	SCQF Level 8. ·Use a wide range of routine skills and some advanced skills in physics. For example: o convey ideas in well-structured and coherent form o use a range of forms of communication effectively in both familiar and new contexts o use a range of numerical and graphical skills in combination o use numerical and graphical data	
Autonomy, Accountability and Working with others	SCQF Level 8. · Exercise some initiative and independence in carrying out defined activities · Take account of own and others' roles and responsibilities in carrying out and evaluating tasks · Work with others in support of current professional practice under guidance	
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	
During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below: The mathematics core part of the module is taught in a lecture theatre using the whiteboard. The classes are supported by problem sheets which demand the student for independent self-study using literature for solvation. The problem sheets are than discussed and possible solution worked out in tutorial classes. This workshop/Mathcad part of the module is based in a computer lab. For each week a handout is pre-issued with an introduction to the topic, some worked examples and some practise problems. Up to half of the classroom time is spent on explanation/teaching and the rest of the time is spent in a tutorial situation where the students attempt the problems, with assistance from tutors where necessary. Students are expected to study the handout before coming to the class and are expected to discuss problems and share ideas, but not to copy the work of others. The handouts are detailed, but wider reading will be necessary for full understanding. Here the internet is particularly useful, with many university websites containing sections on MathCad and examples of usage.	
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
Laboratory/Practical Demonstration/Workshop	24
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:
1. Mathematical Methods in the Physical Science (Mary. L. Boas, Wiley&Sons)

2. Thomas' Calculus (Pearson/Addison Wesley)

(**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	Marcus Scheck
External Examiner	D Faux
Accreditation Details	Institute of Physics
Changes/Version Number	2.15 V2 Moderator updated v2.1 details updated v3.0 The prerequisites were updated Delivery changed from T1 to T2 V4 The prerequisites were updated. Delivery changed from T2 to T1. Probability theory was added to module contents. V5

	Module contents were clarified. In particular, second order ODE were explicitly added.

Assessment: (also refer to Assessment Outcomes Grids below)
60% Assessment Category 1: Final Class Test
40% Assessment Category 2: Coursework Assignments
(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
Portfolio of written work	✓	✓	✓	✓	40	0
Combined Total For All Components					100%	2 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

The work for this module will be carried out in learning studios. 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)