University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Differential Equations 2			
Code: MATH09002	**SCQF Level: 9 (Scottish Credit and Qualifications Framework)**	**Credit Points: 20**	**ECTS: 10 (European Credit Transfer Scheme)**
School:	School of Computing, Engineering & Physical Sciences		
Module Co-ordinator:	Dr Kenneth Nisbet		

Summary of Module

Further topics in calculus will be studied, building on those appearing in MATH08002 and MATH08008. Further common problems in integration will be studied such as the use of Gamma and Beta functions.

The construction of Fourier series will be discussed, together with their properties. Use of Fourier series to solve certain ODEs will be introduced. Mention will be made of Fourier transforms.

Other methods of solution of first order differential equations will be considered, e.g. exact equations. Qualitative analysis of autonomous nonlinear equations will be considered.

Series solution methods, including the method of Frobenius and an introduction to Bessel functions and other special functions, will be studied.

Systems: Both quantitative and qualitative methods in the study of linear and nonlinear first order systems will be considered. This will include the use of Laplace transforms and eigenvalue/eigenvector methods.

Suitable software will be used to solve more elaborate problems in these topics.

The Graduate Attributes relevant to this module are given below:

- Academic: Critical thinker; Analytical; Inquiring; Knowledgeable; Problem-solver; Autonomous; Incisive; Innovative.
- Personal: Motivated; Resilient.
- Professional: Ambitious; Driven.

Module Delivery Method					
Face-To-Face	**Blended**	**Fully Online**	**HybridC**	**Hybrid 0**	**Work-Based Learning**
☒	☐	☐	☐	☐	☐
See Guidance Note for details.					

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) (tick as appropriate)

Paisley:	Ayr:	Dumfries:	Lanarkshire:	London:	Distance/Online Learning:	Other:
☒	☐	☐	☐	☐	☐	Add name

Term(s) for Module Delivery

(Provided viable student numbers permit).

Term 1	☒	Term 2	☐	Term 3	☐

Learning Outcomes: (maximum of 5 statements) These should take cognisance of the SCQF level descriptors and be at the appropriate level for the module. At the end of this module the student will be able to:	
L1	Solve a range of calculus problems involving definite integrals and/or special functions.
L2	Use a range of techniques in the solution and qualitative analysis of ordinary differential equations.
L3	Use a range of techniques in the solution of systems of ordinary differential equations.
L4	Solve a range of problems in calculus using suitable software.

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 **9** Understanding some of the techniques used to solve ordinary differential equations. Demonstrating awareness of established techniques of enquiry in the use of ordinary differential equations in applications.
Practice: Applied Knowledge and Understanding	SCQF Level **9** Using a range of mathematical techniques to obtain solutions of problems. Using a range of specialised techniques to solve ordinary differential equations.

Generic Cognitive skills	SCQF Level **9** Demonstrating a critical understanding of fundamental mathematical concepts. Demonstrating a critical understanding of the validity and limitations of mathematical techniques.
Communication, ICT and Numeracy Skills	SCQF Level **9** Using the output from mathematical reasoning, both manually and via software, to communicate results in a coherent way.
Autonomy, Accountability and Working with others	SCQF Level **9** Collaborating in a small team to investigate and solve problems in mathematics. Producing reports describing the solution of problems in mathematics.

Pre-requisites:	Before undertaking this module, the student should have undertaken the following:	
	Module Code: MATH08002	**Module Title: Differential Equations 1**
	Other:	or equivalent
Co-requisites	**Module Code:**	**Module Title:**

*Indicates that module descriptor is not published.

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** (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

	Hours Total 200

Indicative Resources: (e.g. Core text, journals, internet access)
The following materials form essential underpinning for the module content and ultimately for the learning outcomes: "Differential Equations 2" class notes as published on the University VLE. Suitable bespoke mathematical software. "Differential Equations", FR Giordano and MD Weir. Please ensure the list is kept short and current. Essential resources should be included, broader resources should be kept for module handbooks / Aula VLE. Resources should be listed in Right Harvard referencing style or agreed professional body deviation and in alphabetical order.
(**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.

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. Please ensure any specific requirements are detailed in this section. Module Co-ordinators should consider the accessibility of their module for groups with protected characteristics..
(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
Assessment Results (Pass/Fail)	Yes ☐ No ☒

School Assessment Board	Computing, Engineering & Physical Sciences
Moderator	Dr Wan Mekwi
External Examiner	C Guiver
Accreditation Details	e.g. ACCA Click or tap here to enter text.
Changes/Version Number	2.12. Minor changes in wording in Employability Skills etc. section. Change to Outcomes covered in Coursework assessment.

Assessment: (also refer to Assessment Outcomes Grids below)
The module is assessed by a series of coursework exercises, forming one component, and one final unseen exercise forming a second component.
Assessment 1: Class Test (Unseen, closed book) (70%)
Assessment 2: A series of individual coursework assignments (30%)
(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.)

Assessment Outcome Grids (See Guidance Note)

Component 1							
Assessment Type (Footnote B.)	**Learning Outcome (1)**	**Learning Outcome (2)**	**Learning Outcome (3)**	**Learning Outcome (4)**	**Learning Outcome (5)**	**Weighting (%) of Assessment Element**	**Timetabled Contact Hours**
Class Test (unseen, closed book)	√	√	√			70%	2

Component 2							
Assessment Type (Footnote B.)	**Learning Outcome (1)**	**Learning Outcome (2)**	**Learning Outcome (3)**	**Learning Outcome (4)**	**Learning Outcome (5)**	**Weighting (%) of Assessment Element**	**Timetabled Contact Hours**

Coursework Assignment	√	√	√	√		30%	5

	Combined Total for All Components	**100%**	**7 hours**