

University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Multivariable Calculus			
Code: MATH08008	SCQF Level: 8 (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			
<p>This module extends the ideas in basic differentiation and integration of functions of one variable to the calculus of more than one variable.</p> <p>The idea of partial differentiation will be introduced, both at first and higher order, as well as the more general idea of a directional derivative. These concepts will be used in various settings, including the location and classification of critical points in routine contexts and applications in optimisation problems, e.g. using Lagrange multipliers.</p> <p>Vector calculus will be explored, including a treatment of such notions as the gradient of a scalar field, and the divergence and curl of a vector field, both in routine and applied settings.</p> <p>The concept of basic integration will be extended to a range of problems involving double and triple integrals, e.g. repeated integrals, change of order, use of substitution, such as the use of polar coordinates. Line integrals, including their application to problems involving conservative vector fields, and surface integrals of both scalar and vector fields will be discussed.</p> <p>The Graduate Attributes relevant to this module are given below:</p> <ul style="list-style-type: none">• Academic: Critical thinker; Analytical; Inquiring; Knowledgeable; Problem-solver; Autonomous.• Personal: Motivated; Resilient.• Professional: Ambitious; Driven			

Module Delivery Method					
Face-To-Face	Blended	Fully Online	HybridC	Hybrid 0	Work-Based Learning
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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:
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Add name

Term(s) for Module Delivery					
(Provided viable student numbers permit).					
Term 1	<input checked="" type="checkbox"/>	Term 2	<input type="checkbox"/>	Term 3	<input type="checkbox"/>

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	Apply analytically a range of techniques in partial differentiation.
L2	Solve multiple and line integration problems analytically using standard techniques.
L3	Implement a range of analytic techniques in vector calculus.
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 Demonstrating a knowledge and understanding of important techniques in the calculus of more than one variable. Demonstrating critical awareness of established techniques of enquiry in common applications of multivariable calculus.
Practice: Applied Knowledge and Understanding	SCQF Level 8 Using a range of standard techniques to solve problems at an advanced level, sometimes in non-routine contexts. Conducting defined investigative problems within a mathematically based subject.
Generic Cognitive skills	SCQF Level 8 Conceptualising and analysing problems informed by professional and research issues.

Communication, ICT and Numeracy Skills	SCQF Level 8 Making formal written presentation(s) based on the output from an investigative problem.	
Autonomy, Accountability and Working with others	SCQF Level 8 Exercising independence and initiative in conducting a range of activities. Identifying learning needs through reflection based on self, tutor, and peer evaluation of work.	
Pre-requisites:	Before undertaking this module, the student should have undertaken the following:	
	Module Code: MATH07009	Module Title: Calculus B
	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
Independent Study	164
	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:

"Multivariable Calculus" class notes as published on the University VLE.

"Calculus II", TM Apostol.

"Calculus: One and Several Variables", SL Salas, GJ Etgen and E Hille.

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 <input type="checkbox"/> No <input checked="" type="checkbox"/>
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	1.08. Change to assessment methodology. Change to Terms of delivery.

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: A series of individual coursework assignments (50%)
Assessment 2: Class Test (Unseen, closed book) (50%)
(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)	√	√	√			50%	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	√	√	√			50%	0

Combined Total for All Components	100%	2 hours
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