University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Linear Algebra							
Code: MATH08007	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:	Dr Wan Mekwi						

Summary of Module

This module extends the material on matrices and vectors covered in Level 7.

Properties of square matrices of higher order than 2x2 are covered in detail. This includes a treatment of determinants and their properties, and of their inverses, including a discussion on such topics as adjoint matrices and Cramer's rule. The concepts of eigenvalues and eigenvectors are consolidated in this higher order setting, and extended to a wider range of problems including diagonalisation.

The concept of a vector space is introduced, and then developed to include discussion of subspaces, spanning sets, linear independence, basis and dimension.

Linear transformations are discussed, including matrix representation of these and problems involving a change of basis. Fundamental ideas such as kernel, image rank and nullity of these transformations are discussed, as is the Dimension Theorem.

The concept of an inner product space is introduced, and then developed to extend the familiar notion of perpendicular vectors to the more general orthogonality. Such processes as Gram-Schmidt algorithm are discussed.

The Graduate Attributes relevant to this module are given below:

- 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			
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:	Paisley: Ayr: Dumfries: Lanarkshire: London: Distance/Online Learning: Other:						
\boxtimes						Add name	

Term(s) for Module Delivery								
(Provided viable student numbers permit).								
Term 1 Image: Marcolar matrix Image: Term 2 Image: Term 3 Image:								

Learn These appro At the	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	Determine key features of square matrices of higher order than 2x2, and use them in the solution of a range of problems.						
L2	Use a range of standard techniques in problems involving vector spaces and their applications.						
L3	Apply a range of standard techniques in problems involving inner product spaces and Gram-Schmidt orthogonalisation						
L4	Solve a range of problems that require the use of linear transformations and their associated properties.						

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 a range of important mathematical constructs in linear algebra				
Practice: Applied Knowledge and Understanding	SCQF Level 8 Using a range of standard techniques to solve problems, in a range of contexts.				
Generic Cognitive skills	SCQF Level 8				

	Conceptualising and analysing problems with the aid of appropriate concepts.				
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 carrying out a range of activities.				
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	48					
Independent Study	152					
200 Hours Total						
**Indicative Resources: (eg. Core text, journals, inter	met access)					

The following materials form essential underpinning for the module content and ultimately for the learning outcomes:

H. Anton and C. Rorres, Elementary linear algebra: applications version, John Wiley & Sons, 2013

D. Poole, Linear algebra: A modern introduction, Cengage Learning, 2014

"Linear Algebra" lecture notes as published on the University VLE

(**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 <u>Student Attendance and Engagement Procedure</u>: 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: <u>UWS Equality, Diversity and Human Rights Code.</u>

(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 and Physical Sciences
Assessment Results (Pass/Fail)	Yes □No ⊠
School Assessment Board	Computing, Engineering and Physical Sciences
Moderator	Dr Raymond Carragher
External Examiner	P Wilson
Accreditation Details	

Changes/Version Number	Slight change to Learning and Teaching Hours.
	Slight change to assessment component title and category.

Assessment: (also refer to Assessment Outcomes Grids below)

Assessment 1 - A portfolio of written work (50%)

Assessment 2 – Class test: formal unseen assessment (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							
Assessmen t Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Learning Outcome (5)	Weighting (%) of Assessment Element	Timetable d Contact Hours
Portfolio	~	~	~	~		50	

Component 2							
Assessmen t Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Learning Outcome (5)	Weighting (%) of Assessment Element	Timetable d Contact Hours
Class Test (unseen, closed book)	~	~	~	~		50	2

Combined Total for All Component	s 100%	2 hours
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