University of the West of Scotland
Module Descriptor

Session: 2023/24

Last modified: 02/05/2023 15:50:50
Status: Pending

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:	Wan R Mekwi		

Summary of Module

This module extends the material on matrices and vectors covered in Calculus A and B. 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 orthogonalisation 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**	**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. 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.

	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	
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
	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:
“Linear Algebra” class notes as published on the University VLE.

"Linear Algebra: A Modern Introduction", D Poole.

"Linear Algebra and Geometry", D Smart.

"Elementary Linear Algebra", H Anton

(**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
In line with the Academic Engagement Procedure, Students are defined as academically engaged if they are regularly engaged with timetabled teaching sessions, course-related learning resources including those in the Library and on the relevant learning platform, and complete assessments and submit these on time. Please refer to the Academic Engagement Procedure at the following link: Academic engagement procedure

Supplemental Information

Programme Board	Physical Sciences
Assessment Results (Pass/Fail)	No
Subject Panel	Physical Sciences
Moderator	TBC
External Examiner	P Wilson
Accreditation Details	
Changes/Version Number	1.08 Module Coordinator change. Amendments to assessment Changed delivery mode to "face-to-face" for new AY Updated some other module titles referred to in the description of the module

Assessment: (also refer to Assessment Outcomes Grids below)
A series of coursework assignments; 50% of the final mark
A final, unseen examination, 50% of the final mark
(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
Unseen closed book (standard)	✓	✓	✓	✓	50	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
Class test (practical)	✓	✓	✓		50	6
Combined Total For All Components					100%	8 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 module is suitable for any student satisfying the pre-requisites.
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)