Session: 2023/24

Title of Module: Discrete Mathematics 2			
Code: MATH08006	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:	Kwok Chi Chim		

Summary of Module
This module extends the ideas of discrete mathematics introduced in Sequences and Patterns (MATH07002). Below is a list of the topics that will be covered. **Recurrence relations:** Recurrence relations, first and second order linear difference equations, stability of solutions, one dimensional maps, fixed points and their stability, logistic map, orbit diagram, period doubling to chaos, bifurcations **Number theory:** Divisibility, Euclid's lemma, Euclid's algorithm, linear Diophantine equations; definition of a prime, fundamental theorem of arithmetic, Sieve of Eratosthenes, Fermat's factorization method, congruences and their properties. **Graph theory:** Definition and representations of graphs, valency, paths and cycles, Hamiltonian cycle, trees, Euler's formula, weighted graph, shortest path problem, Djikstra's algorithm, minimum spanning tree, definitions of digraph and network, flows and cuts, sources and sinks, max-flow min-cut theorem 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. Demonstrate a knowledge and understanding of a range of techniques involving recurrence relations.
L2. Apply number theory results to problems in divisibility and the solving of linear Diophantine equations.
L3. Implement the fundamental concepts in graph theory to a range of 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. Demonstrating a knowledge and understanding of a range of standard techniques in discrete mathematics. Demonstrating critical awareness of established techniques of enquiry in applications of these techniques.
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. Carrying out 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 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: MATH07002	**Module Title:** Discrete Mathematics 1
	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
Laboratory/Practical Demonstration/Workshop	0
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:
"Discrete Mathematics" class notes as published on the University VLE.

"Nonlinear Dynamics and Chaos", SH Strogatz

"Elementary Number Theory", D Burton

"Introduction to Graph Theory", RJ Wilson

"Discrete Mathematics", NL Biggs

"Modern Algebra", JR Dublin

(**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	Dr Kenneth C Nisbet
External Examiner	P Wilson
Accreditation Details	
Changes/Version Number	1.08 Module Coordinator change. Change in the summary of module Change in module delivery Change in learning activity Change in Assessment Changed module title to "Discrete Mathematics 2" because it is now part of a sequence Changed delivery mode to "face-to-face" for new AY

Assessment: (also refer to Assessment Outcomes Grids below)

Assignment: a series of coursework assignments, 50% of the final mark

Adapted Assessment: a final, unseen assessment, 50% of the final mark

Assessment Outcome Grids (Footnote A.)

Component 1

Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	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)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Class test (written)	✔	✔	✔	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)