Module Descriptor

Title	Numerical Analysis		
Session	2025/26	**Status**	Published
Code	MATH09014	**SCQF Level**	9
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	Dr Wan R Mekwi		

Summary of Module

This module is intended to serve as a first course in numerical analysis and uses computer software to solve problems in mathematics.

It will cover computer arithmetic, the fundamental areas of error analysis, numerical methods for the solution of equations in one variable (root-finding algorithms), interpolation and polynomial approximation, and numerical integration.

Error analysis will consider round-off errors and computer arithmetic, along with algorithms and convergence.

Iterative root-finding algorithms will be explored including fixed-point, bisection, secant and Newton's method for functions of a single-variable. Methods for functions of multiple variables will be briefly introduced.

Polynomial interpolation will be considered and interpolation error will also be discussed. Approximation using polynomials will also be explored.

Quadrature rules including Newton-Cotes and Gaussian quadrature will be designed and analysed together with error estimates.

Module Delivery Method	**On-Campus[1]**	**Hybrid[2]**	**Online[3]**	**Work -Based Learning[4]**
	☒	☐	☐	☐

[1] Where contact hours are synchronous/ live and take place fully on campus. Campus-based learning is focused on providing an interactive learning experience supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus contact hours will be clearly articulated to students.

[2] The module includes a combination of synchronous/ live on-campus and online learning events. These will be supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus and online contact hours will be clearly articulated to students.

[3] Where all learning is solely delivered by web-based or internet-based technologies and the participants can engage in all learning activities through these means. All required contact hours will be clearly articulated to students.

[4] Learning activities where the main location for the learning experience is in the workplace. All required contact hours, whether online or on campus, will be clearly articulated to students

Campuses for Module Delivery	☐ Ayr ☐ Dumfries		☐ Lanarkshire ☐ London ☒ Paisley		☐ Online / Distance Learning ☐ Other (specify)	
Terms for Module Delivery	Term 1	☒	Term 2	☐	Term 3	☐
Long-thin Delivery over more than one Term	Term 1 – Term 2	☐	Term 2 – Term 3	☐	Term 3 – Term 1	☐

Learning Outcomes	
L1	Use root-finding techniques successfully and perform associated error analysis
L2	Implement and apply polynomial interpolation and approximation techniques.
L3	Apply quadrature rules to approximate integrals.
L4	Solve standard problems in computer arithmetic.
L5	

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 9** Demonstrating a knowledge and understanding of important techniques in the numerical solution of equations in one variable, interpolation, numerical integration.
Practice: Applied Knowledge and Understanding	**Please select SCQF Level** 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	**Please select SCQF Level** Conceptualising and analysing problems informed by professional and research issues.
Communication, ICT and Numeracy Skills	**Please select SCQF Level** Implementing mathematical concepts and interpreting outputs using suitable mathematical software. Making formal written presentation(s) based on the output from an investigative problem.
Autonomy, Accountability and Working with Others	**Please select SCQF Level** 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.

Prerequisites	Module Code	Module Title
	MATH08007	Linear Algebra
	MATH08008	Multivariable Calculus
	Other	
Co-requisites	**Module Code**	**Module Title**

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** (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture / Core Content Delivery	36
Laboratory / Practical Demonstration / Workshop	12
Independent Study	152
Please select	
Please select	
Please select	
TOTAL	200

Indicative Resources
The following materials form essential underpinning for the module content and ultimately for the learning outcomes: R L. Burden and J D Faires, Numerical Analysis, 9th ed., 2011 T. Sauer, Numerical analysis, Addison-Wesley Publishing Company, 2011. D. R. Kincaid and E. W. Cheney, Numerical analysis: mathematics of scientific computing, vol. 2, American Mathematical Soc., 2009. Suitable mathematical software such as MATLAB or Python
(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. **For the purposes of this module, academic engagement equates to the following:**

The School of Computing, Engineering and Physical Sciences considers attendance and engagement to mean a commitment to attending, and engaging in, timetabled sessions. You will scan your attendance via the scanners each time you are on-campus and you will login to the VLE several times per week. Where you are unable to attend a timetabled learning session due to illness or other circumstance, you should notify the Programme Leader that you cannot attend. Across the School an 80% attendance threshold is set. If you fall below this, you will be referred to the Student Success Team to see how we can best support your studies.

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. Aligned with the University's commitment to equality and diversity, this module supports equality of opportunity for students from all backgrounds and learning needs. Using the VLE, material will be presented electronically in formats that allow flexible access and manipulation of content. This module complies with University regulations and guidance on inclusive learning and teaching practice. This module has lab-based teaching and as such you are advised to speak to the Module Co-ordinator to ensure that specialist assistive equipment, support provision and adjustment to assessment practice can be put in place, in accordance with the University's policies and regulations.
(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**
Overall Assessment Results	☐ **Pass / Fail** ☒ **Graded**
Module Eligible for Compensation	☒ **Yes** ☐ **No** **If this module is eligible for compensation, there may be cases where compensation is not permitted due to programme accreditation requirements. Please check the associated programme specification for details.**
School Assessment Board	Computing, Engineering and Physical Sciences
Moderator	Dr Alan J Walker
External Examiner	P. Wilson
Accreditation Details	
Module Appears in CPD catalogue	☐ **Yes** ☐ **No**
Changes / Version Number	

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
A portfolio of written and computer work (40%)
Assessment 2
Class test: formal unseen assessment (60%)
Assessment 3

(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.)

Component 1							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Portfolio of written and computer work	☒	☒	☒	☒	☐	40	

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Class test	☒	☒	☒	☒	☐	60	2

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
	☐	☐	☐	☐	☐		
Combined total for all components						100%	2 hours

Change Control

What	**When**	**Who**
Tidied up prerequisites	02/04/2025	R. Meeten