Module Descriptor

Title	Complex Analysis		
Session	2025/26	**Status**	Published
Code	MATH09009	**SCQF Level**	9
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	Ryan P. Meeten		

Summary of Module

This module extends the material on complex numbers encountered in prior study to discuss complex functions, and their use in geometry and calculus.

Complex functions will be treated, including power, trigonometric, exponential, logarithmic, and the Gamma and Beta functions. Rational complex functions will be used to motivate a discussion of Mobius transformations.

Mappings, branches, branch cuts and points will be introduced as well as their application to boundary value problems in physics and engineering.

The idea of limits and differentiability, including reference to the Cauchy-Riemann equations, will be described, as will the idea of analyticity. The notion of Wirtinger derivatives will be briefly considered. Taylor and Laurent series will also be discussed.

Integrals of complex functions will be studied, and will extend to cover contour integrals including Cauchy's integral theorems and the calculus of residues, for which a discussion of isolated singularities will be necessary. Residue calculus will be applied to the calculation of common integral transforms and their inverses.

Some important results in complex analysis will also be covered, such as the Poisson Integral formula, Rouché's Theorem, and the Schwarz-Christoffel transformation.

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	On-Campus[1] ☒	Hybrid[2] ☐	Online[3] ☐	Work -Based Learning[4] ☐
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	Demonstrate a detailed knowledge and understanding of complex functions.
L2	Use a range of differentiation techniques for complex functions, and their applications.
L3	Use a range of integration techniques for complex functions, and their applications.
L4	Use complex variables in the analysis of important classes of real integrals, including improper integrals.
L5	Use a computer algebra system to explore and analyse complex functions and complex integrals.

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 detailed knowledge and understanding of important techniques necessary in the use of complex functions. Demonstrating critical awareness of established techniques of enquiry in common applications of complex functions.
Practice: Applied Knowledge and Understanding	**SCQF 9** Using a range of standard techniques to solve problems at an advanced level, sometimes in non-routine contexts.

[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

	Carrying out defined investigative problems within a mathematically based subject.
Generic Cognitive skills	**SCQF 9** Conceptualising and analysing problems informed by professional and research issues.
Communication, ICT and Numeracy Skills	**SCQF 9** Formally presenting standard topics in the field of complex analysis to a range of audiences. Using a computer algebra system to perform routine analyses related to complex functions and integrals.
Autonomy, Accountability and Working with Others	**SCQF 9** 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** MATH08008	**Module Title** Multivariable Calculus
	Other Or equivalent	
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	24
Tutorial / Synchronous Support Activity	12
Laboratory / Practical Demonstration / Workshop	12
Independent Study	152
n/a	
n/a	
TOTAL	200

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

"Complex Analysis" class notes as published on the University VLE. "Complex Variables: Introduction and Applications (2nd Ed)", MJ Ablowitz and A Fokas, 2011, Cambridge University Press. "Complex Analysis", IN Stewart and DO Tall, 1983, Cambridge University Press. "Complex Variables", M Spiegel, 1980, McGraw-Hill Education.
(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 log in 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 that 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	Mathematics and Physics

Moderator	K. Nisbet
External Examiner	C. Guiver
Accreditation Details	
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	1.08 Module coordinator changed Computer lab component added; module hours updated Learning outcome added related to lab Minor updates to the module summary

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Class Test (Unseen, closed book) (70%)
Assessment 2
A series of coursework assignments (30%)
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**
Class Test (unseen, closed book)	☒	☒	☒	☒	☐	70	2

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Coursework	☒	☒	☒	☒	☒	30	0

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
Updated MC and module summary for 25-26	March 2025	R. Meeten
Added computer lab component	March 2025	R. Meeten
Added learning outcome for lab	March 2025	R. Meeten
Added new EDI and Attendance / Engagement statements	March 2025	R. Meeten