University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Fluids and Aerodynamics			
Code: ENGG08028	**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 Noorfazreena Kamaruddin		

Summary of Module

This module is designed to provide students with a detailed understanding of the principles of fluid dynamics and aerodynamics and to show the importance of aerodynamics in the design and performance of aircraft.

Outcome 1 is intended to develop the student's understanding of key concepts in fluid mechanics. Students will gain understanding of key fluid properties, as well as types of flows such as laminar/turbulent and incompressible/incompressible. Students will apply their understanding to analyse problems in fluid statics and dynamics; examples include fluid flow in pipes and bounded channels.

Outcome 2 is intended to provide the student with an understanding of experimental fluid dynamics and aerodynamics. Students will conduct fluid dynamics experiments. Wind tunnel theory and operation will be discussed, and practical wind tunnel testing will be carried out.

Outcome 3 is intended to develop the student's understanding of aerodynamic lift and drag. Airfoil characteristics will be studied in further detail, leading to vortex flow, thin airfoil theory, and lifting line theory. Pressure drag and skin friction drag will be discussed, followed by analysis of the drag polar. Variation of lift and drag with Reynolds number and Mach number will also be analysed.

Outcome 4 is intended to develop the student's understanding of key aircraft wing characteristics, such as taper ratio and sweep, as well as their understanding of key features such as winglets and high-lift devices.
By undertaking this module, students will have the opportunity to develop their UWS Graduate Attributes (https://www.uws.ac.uk/current-students/your-graduate- attributes/), including critical thinking, problem solving, effective communication, autonomy and creativity.

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:	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) At the end of this module the student will be able to:	
L1	Analyse fluid mechanics problems where possible relevant to aircraft systems.
L2	Conduct experimental tests and interpret and critically evaluate the experimental data.
L3	Analyse aircraft lift and drag and the impact they have on aerodynamic performance and aircraft design.
L4	Examine wing geometry and characteristics and demonstrate an understanding of the role they play in aerodynamic performance and aircraft design.

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 broad and integrated knowledge and understanding of the key areas in experimental aerodynamics, aircraft lift and drag, and wing geometry. Demonstrating a critical understanding of a selection of principal theories, principles, concepts and terminology.
Practice: Applied Knowledge and Understanding	SCQF Level **8** Use a selection of the principal skills, techniques, practices and/or materials associated with engineering and industrial tasks.

Generic Cognitive skills	SCQF Level **8** Be able to compare suggested solutions with expected values.	
Communication, ICT and Numeracy Skills	SCQF Level **8** The ability to report in writing and orally on experimental findings. Use a range of IT applications to facilitate calculations and provision of report and presentations. Interpret and evaluate numerical and graphical data and use it to design and analyse equipment and systems.	
Autonomy, Accountability and Working with others	SCQF Level **8** Take some responsibility for use of appropriate data resources. Practice in ways which take account of own role and responsibilities. Work under guidance with qualified practitioners.	
Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code:	**Module Title:**
	Other:	
Co-requisites	**Module Code:**	**Module Title:**

*Indicates that module descriptor is not published.

Learning and Teaching	
Formative assessment will be provided in the form of class quizzes and example problems, during tutorial sessions, during laboratory sessions, and as part of preparation for written submissions.	
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	18
Tutorial/Synchronous Support Activity	18

Laboratory	3
Independent Study	161
	Hours Total 200

****Indicative Resources: (eg. Core text, journals, internet access)**

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

Access to wind tunnel facilities.

Course notes and presentations will be provided. Texts:

Douglas, J F, Fluid Mechanics, 6th edition, Prentice Hall, 2011

White, F M, Fluid Mechanics, McGraw-Hill Higher Education, 7th edition, 2011

Anderson, J.D. (2010) Fundamentals of Aerodynamics. 5th ed. McGraw- Hill

Barnard, R.H and Philpott, D.R. (2009) Aircraft Flight: A Description of the Physical Principles of Aircraft Flight. 4th ed. Prentice-Hall

Houghton, E.L. (2003) Aerodynamics for Engineering Students. 5th ed. Butterworth-Heinemann

Kuethe, A. and Chow, C (1997) Foundations of Aerodynamics. John Wiley & Sons

(**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.

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.

(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	Engineering
Moderator	Bassam Rakhshani
External Examiner	E Tingas
Accreditation Details	This module is part of the IMechE accredited programmes BEng/Meng (Hons) Aircraft Engineering
Changes/Version Number	Module Coordinator changed to Dr Noorfazreena Kamaruddin from Stephanie Docherty. Module Delivery Changed to Face-To-Face from Hybrid C. Assessment text changed to reflect a consistency within the programme.

Assessment: (also refer to Assessment Outcomes Grids below)
Component 1 – Unseen Closed Book Class Test (50%)
Component 2 – Laboratory (40%) & Unseen Closed Book Class test (10%)
(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						
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 (written)	✓		✓	✓	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 (written)	✓		✓		10	1
Laboratory/ Clinical/ Field notebook	✓	✓			40	3
Combined Total for All Components					**100%**	**6 hours**