Module Descriptor

Title	Fluids and Aerodynamics		
Session	2025/26	**Status**	Published
Code	ENGG08028	**SCQF Level**	8
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	N 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.

During the course of this module students will develop their UWS Graduate Attributes (https://www.uws.ac.uk/current- students/your-graduate-attributes/) in the following areas-

Universal: Academic - Critical thinking, analytical & inquiring mind; Personal- Ethical; Professional- Research Minded

Work-Ready: Academic - Knowledgeable, Digitally Literate, Problem Solver; Personal - Effective Communicator; Professional - Ambitious

Successful : Academic - Autonomous; Personal - Resilient; Professional- Driven

This module has been reviewed and updated, taking cognisance of the University's Curriculum Framework principles. Examples of this are found within the module such as active and engaging laboratory and tutorial activity, module assessment which reflects real-life (industry) problems/activities, development of problem-solving skills, recorded lecture content supporting students to organise their own study time and the use of integrated group activities supporting learning communities

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	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.
L5	N/A

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 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 their principal theories, principles, concepts and terminology.

[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

Practice: Applied Knowledge and Understanding	**SCQF 8** Use a selection of the principal skills, techniques, practices and/or materials associated with engineering and industrial tasks.
Generic Cognitive skills	**SCQF 8** Be able to compare suggested solutions with expected values.
Communication, ICT and Numeracy Skills	**SCQF 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 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.

Prerequisites	**Module Code**	**Module Title**
	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. The learning and teaching activity for this module include lectures, laboratories, tutorials and problem based learning.	
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	18
Tutorial / Synchronous Support Activity	18
Laboratory / Practical Demonstration / Workshop	3
Independent Study	161
n/a	0
n/a	0
TOTAL	200

Indicative Resources

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

Access to wind tunnel facilities.

Anderson, J.D. (2010) Fundamentals of Aerodynamics. 5th edn. New York: McGraw-Hill.

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

Bertin, J.J. and Cummings, R.M. (2013) Aerodynamics for Engineers. 6th edn. Boston: Pearson.

Douglas, J.F., Gasiorek, J.M., Swaffield, J.A. and Jack, L.B. (2011) Fluid Mechanics. 6th edn. Harlow: Prentice Hall.

Drela, M. (2014) Flight Vehicle Aerodynamics. Cambridge, MA: MIT Press.

Houghton, E.L., Carpenter, P.W., Collicott, S.H. and Valentine, D.T. (2003) Aerodynamics for Engineering Students. 5th edn. Oxford: Butterworth-Heinemann.

Kuethe, A.M. and Chow, C.Y. (1997) Foundations of Aerodynamics. 5th edn. New York: John Wiley & Sons.

White, F.M. (2011) Fluid Mechanics. 7th edn. New York: McGraw-Hill Higher 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. Students will scan their attendance, via the attendance scanners, each time they are on-campus, they will have their attendance recorded in class and they will be expected to login to the VLE several times per week. Students who are unable to attend a timetabled session, due to illness or other circumstance, should notify their Programme Leader. Across the School an 80% attendance threshold is set. Students who fall below this, will be referred to the Student Success Team to see how they can be best supported in their 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 laboratory-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	Engineering
Moderator	B Rakhshani
External Examiner	E Tingas
Accreditation Details	This module is part of the IMechE accredited programmes BEng/MEng (Hons) Mechanical Engineering
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	Module Descriptor copied to 2025/26 template and resources list updated to reflect ILR feedback, Attendance, Engagement and EDI statements updated. Assessment component updated to reflect School decsion on sub-components.

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Assessment Category 1: Class Test (Unseen, Closed Book), Weight – 50%
Assessment 2
Assessment Category 2: Laboratory, Weight – 40%
Assessment 3
Assessment Category 3: Class Test (Unseen, Closed Book), Weight – 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.)

Component 1							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Unseen Closed Book (Class Test)	☒	☐	☒	☒	☐	50	2

Component 2

Assessment Type	LO1	LO2	LO3	LO4	LO5	Weighting of Assessment Element (%)	Timetabled Contact Hours
Laboratory	☒	☒	☐	☐	☐	40	3

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Unseen Closed Book (Class Test)	☒	☐	☒	☐	☐	10	1
Combined total for all components						100%	6 hours

Change Control

What	When	Who
Module Descriptor copied to 2025/26 template and resources list updated to reflect ILR feedback, Attendance, Engagement and EDI statements updated. Assessment component updated to reflect School decision on sub-components.	March 2025	N Kamaruddin