University of the West of Scotland

Module Descriptor

Session:

Last modified:

Status:

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 Engineering and Computing		
Module Co-ordinator:	Stephanie Docherty		

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
	✓	

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.

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.

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

Campus(es) for Module Delivery

The module will **normally** be offered on the following campuses / or by Distance Learning (D/L) (ie.Virtual Campus): (Provided viable student numbers permit)

Paisley:	Ayr:	Dumfries:	Hamilton:	D/L Virtual Campus:	Other:
✓					

Learning Outcomes: (maximum of 5 statements)

On successful completion 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

The learning and teaching activity for this module include lectures, 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:	**Categories**	**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	Scheduled	18
Tutorial/Synchronous Support Activity	Scheduled	18
Laboratory/Practical Demonstration/Workshop	Scheduled	3
Independent Study	Independent	161
		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:

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 Requirements

It is expected that students will attend all scheduled classes or participate with all delivered elements as part of their engagement with their programme of study. Please refer to UWS Regulation 5.3.6.

Course Reference Numbers (CRNs) (if known)

Paisley:	Ayr:	Dumfries:	Hamilton:	D/L Virtual Campus:	Other:
Not known					

Term (s) for Module Delivery

(Provided viable student numbers permit).

Term 1	✓	Term 2		Term 3	

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Subject Development Group (SDG)	Engineering
Assessment Results (Pass/Fail)	No
Subject Panel	Engineering
Moderator	Bassam Rakhshani
External Examiner	E Tingas
Accreditation Details	IMechE
Changes/Version Number	

Assessment: (also refer to Assessment Outcomes Grids at end of document)
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. Assessment Category 1: Unseen open book examination worth 50% of the final mark
Assessment Category 2: Continuous assessment in the form of: o five multiple-choice class quizzes worth 10% of the final mark, o an individual report on wind tunnel testing worth 30% of the final mark; o a group report based on lab work worth 10% of the final mark.
(N.B. (i) **Assessment Outcomes Grids** for the module (one for each main assessment category) can be found at the end of this descriptor 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 Handbook.)

Assessment Outcome Grids (Footnote A.)

Assessment Category 1

Assessment Category	Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Weighting (%) of Assessment Element	Timetabled Contact Hours
	Unseen open book	✓		✓	✓	50	2

Assessment Category 2

Assessment Category	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	
	Laboratory/ Clinical/ Field notebook	✓	✓			40	3
Combined Total For All Assignment Categories						100%	5 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).
3. This will normally be variable across Schools, dependent on Programmes &/or Professional requirements.

Equality and Diversity

This module is suitable for any student with appropriate engineering background, however it should be noted that in order for you to complete this module the

laboratory element of coursework will require to be undertaken, special support can be provided where necessary, consequently, if special support is needed to complete this part of the module, then the University's Health and Safety Officer should be consulted to make sure that safety in the laboratory is not compromised. Current University Policy on Equality and Diversity applies. 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)