SCIE C1605: Aviation Science 1

Module Title:	Aviation Science 1
Language of Instruction:	English

Credits:	5

NFQ Level:	6

Module Delivered In	3 programme(s)

Teaching & Learning Strategies:	A combination of lectures, class discussion and demonstrations will be used. Particular emphasis will be placed on active learning including problem / project based learning.

Module Aim:	The student will understand basic and intermediate concepts of fluid dynamics and aerodynamic and how to apply these concepts to an aircraft design and performance during all stages of flight, so they develop simple aerodynamic analytical and troubleshooting skills.

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Explain the theoretical fundamentals of the International Standard Atmosphere (ISA)
LO2	Apply fundamentals of Fluid Dynamics for Aerodynamic Design.
LO3	Describe basic aerodynamic fundamentals with the aid of sketches/drawings
LO4	Perform wind tunnel testing, measurements and flow visualization
LO5	Calculate flight forces in steady climbs, descents, glides and turns and give general descriptions of Theory of flight, Airplane/Rotary Aerodynamics, Flight Controls and Stability

Pre-requisite learning
Module Recommendations *This is prior learning (or a practical skill) that is recommended before enrolment in this module.*
No recommendations listed
Incompatible Modules *These are modules which have learning outcomes that are too similar to the learning outcomes of this module.*
No incompatible modules listed
Co-requisite Modules
No Co-requisite modules listed
Requirements *This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.*
No requirements listed

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Module Content & Assessment

Indicative Content
Introduction History of Aerodynamics up to Modern Era, Units and Dimensions, Properties and Classification of Flows, Fundamentals of Fluid Dynamics
Physics of the Atmosphere International Standard Atmosphere (ISA), application to aerodynamics
Aerodynamics Airflow around a body; Boundary layer, laminar and turbulent flow, free stream flow, relative airflow, upwash and downwash, vortices, stagnation; The terms: camber, chord, mean aerodynamic chord, profile (parasite) drag, induced drag, centre of pressure, angle of attack, wash in and wash out, fineness ratio, wing shape and aspect ratio; Thrust, Weight, Aerodynamic Resultant; Generation of Lift and Drag: Angle of Attack, Lift coefficient, Drag coefficient, polar curve, stall; Aerofoil contamination including ice, snow, frost.
Theory of Flight Relationship between lift, weight, thrust and drag; Glide ratio; Steady state flights, performance; Theory of the turn; Influence of load factor: stall, flight envelope and structural limitations; Lift augmentation
Flight Stability and Dynamics Longitudinal, lateral and directional stability (active and passive).
High Speed Flight Speed of sound, pressure waves from a moving source, compressibility, Mach number, flight speed classifications, subsonic and supersonic flow patterns, development of shock waves, shock stall.
Experiments in Aerodynamics Theoretical Knowledge of Instrumentation, Measurements related to Aerodynamics, Basics of Wind Tunnels from low-speed to High-Speed Flow.
Rotary wing aerodynamics Rotor systems, flight controls, hovering flight, coriolis and ground effect, gyroscopic precession, transverse flow, disymmetry of lift, autorotation.

Assessment Breakdown	%
Continuous Assessment	10.00%
Practical	30.00%
End of Module Formal Examination	60.00%

Continuous Assessment

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Examination	Continuous assessment tests during term time covering	1,2,5	10.00	n/a

No Project

Practical

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Pencil drawings & Sketches	3	10.00	n/a
Practical/Skills Evaluation	Aerodynamic Wind Tunnel Labs in Hangar	3,4	20.00	n/a

End of Module Formal Examination

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Formal Exam	Each student will sit a formal written examination at the end of the module	1,2,3,5	60.00	End-of-Semester

SETU Carlow Campus reserves the right to alter the nature and timings of assessment

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Module Workload

Workload: Full Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lecture	12 Weeks per Stage	2.00
Practicals	12 Weeks per Stage	3.00
Independent Learning	15 Weeks per Stage	4.33
	Total Hours	125.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_EEAER_B	Bachelor of Engineering (Honours) in Aerospace Engineering	1	Mandatory
CW_EEACS_D	Bachelor of Engineering in Aircraft Systems	1	Mandatory
CW_EEPLT_D	Bachelor of Science in Pilot Studies	1	Mandatory