

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	
<i>On successful completion of this module the learner should be able to:</i>	
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 <i>This is prior learning (or a practical skill) that is recommended before enrolment in this module.</i>	
No recommendations listed	
Incompatible Modules <i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module.</i>	
No incompatible modules listed	
Co-requisite Modules	
No Co-requisite modules listed	
Requirements <i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.</i>	
No requirements listed	

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

Module Workload

Workload: Full Time		
<i>Workload Type</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
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