

Module Title:	Aerodynamics and Flight Control Systems
Language of Instruction:	English
Credits:	5
NFQ Level:	7
Module Delivered In	2 programme(s)
Teaching & Learning Strategies:	This module will be taught by Lectures, Tutorials and by using Model & Actual Aircraft and Sample Questions.
Module Aim:	The student will understand intermediate and advanced aerodynamics concepts and how they apply to an aircraft during all stages of flight so they develop basic analytical and troubleshooting skills essential to an aircraft technician.

Learning Outcomes	
<i>On successful completion of this module the learner should be able to:</i>	
LO1	Explain the aerodynamic behaviour of a fixed/rotary-winged aircraft during all phases of flight
LO2	Understand and explain the operation of flight controls and their aerodynamic effects
LO3	Define and describe the technical terms associated with high speed flight
LO4	Demonstrate a good knowledge of rotary wing operation, control and aerodynamics
LO5	Design and test an aeroplane/UAV using aircraft design software

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

Aeroplane Aerodynamics and Flight Controls

Operation and effect of: - roll control: ailerons and spoilers; - pitch control: elevators, stabilators, variable incidence stabilisers and canards; - yaw control, rudder limiters; Control using elevons, ruddervators; High lift devices, slots, slats, flaps, flaperons; Drag inducing devices, spoilers, lift dumpers, speed brakes; Effects of wing fences, saw tooth leading edges; Boundary layer control using, vortex generators, stall wedges or leading edge devices; Operation and effect of trim tabs, balance and antibalance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels

Flight Controls (ATA 27)

Primary controls: aileron, elevator, rudder; spoiler; Trim control; Active load control; High lift devices; Lift dump, speed brakes; System operation: manual, hydraulic, pneumatic; Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks. Stall protection systems System operation: electrical, fly by wire

High Speed Flight

Speed of sound, subsonic flight, transonic flight, super-sonic flight, Mach number, critical Mach number, compressibility buffet, shock wave, aerodynamic beating, area rule; Factors affecting airflow in engine intakes of high speed aircraft; Effects of sweepback on critical Mach number

Rotary Wing Aerodynamics

Terminology; Operation and effect of cyclic, collective anti-torque controls. Effects of gyroscopic precession Torque reaction and directional control Dissymmetry of lift, Blades tip stall Translating tendency and its correction Coriolis effect and compensation Vortex ring state, power setting, overpitching Auto-rotation Ground effect

Flight Control Systems

Cyclic control Collective control Swashplate Yaw control – Anti- Torque Control, Tail rotor, bleed air

Assessment Breakdown	%
Continuous Assessment	30.00%
End of Module Formal Examination	70.00%

Continuous Assessment

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Short Answer Questions	Each student will take Sketch/Drawing/Short Answer-format Continuous Assessments, administered during term time for which a maximum of 30% will be awarded.	1,2,3,4,5	30.00	n/a

No Project

No Practical

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 for which a maximum of 70% will be awarded.	1,2,3,4	70.00	End-of-Semester

ITCarlow 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	Every Week	1.00
Tutorial	Every Week	0.50
	Total Hours	1.50

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_EEAER_B	Bachelor of Engineering (Honours) in Aerospace Engineering	5	Mandatory
CW_EEACS_D	Bachelor of Engineering in Aircraft Systems	5	Mandatory