AVIA H4601: Flight Mechanics

Module Title:	Flight Mechanics
Language of Instruction:	English

Credits:	5

NFQ Level:	8

Module Delivered In	1 programme(s)

Teaching & Learning Strategies:	The module will be delivered with a blend of lectures, tutorials and problem-based learning with laboratory sessions, and individual self-directed research. This will include case study exercises and demonstration videos.

Module Aim:	The aim of this module is to introduce learners to the fundamental theories that form the basis of evaluating an aircraft's performance, and apply techniques to predict and analyse performance in various stages of flight.

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Assess the atmospheric properties that influence aircraft performance.
LO2	Formulate the equations of motion for an aircraft in 2D flight.
LO3	Apply mathematical models to different phases of flight, and identify the inherent assumptions and limitations.
LO4	Analyse aircraft performance predictions using computer simulation techniques.

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
The ISA • relative density, pressure and temperature • the equation of state • the hydrostatic equation • Mach number, equivalent airspeed, calibrated airspeed, true airspeed.
Weight Performance • aircraft mass estimation • wing loading • range and endurance calculations.
Drag • maximum lift to drag ratio • minimum drag and minimum power airspeeds • plot the Drag Polar (Appendix 2 to CS23).
Engine Performance • general engine performance • determine fuel flows and specific fuel values • derive and calculate the propulsive efficiency • understand thrust and power characteristics.
Performance • aircraft ceiling • important airspeeds • limiting factors on flight envelopes (CS23.333) • corner velocities • accelerated stall lines • structural limits • cruise performance • specific range and endurance • take-off distance (CS23.59) • landing distance (CS23.75).
Manoeuvres • stall speed (CS23.39) • speed stability • load factor • max load factor in a turn (V-N Diagram) (CS23.337) • climbing flight • turning performance • gliding performance.
Mathematical Modelling • mathematical modelling • simulation • performance prediction • performance analysis.
Flight Testing • flight testing in a simulator • flight testing in a real live aircraft • flight test planning • test data capture • performance prediction.

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	Students will be expected to sit one or more individual written assessments throughout the academic year, typically at the conclusion of one or more learning outcomes.	1,2,3	10.00	Week 7

No Project

Practical

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Students will carry out a number of laboratory sessions throughout the academic year to enhance their understanding of the module, and will produce written reports describing each one. Laboratory practical work will include investigation of the following topics: flight performance estimation and analysis; computer simulation tools and mathematical modelling; real time flight analysis. It is envisaged that a number of these laboratory sessions will take place in both a simulated and a live aircraft flight environment.	1,2,3,4	30.00	Every Second Week

End of Module Formal Examination

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Formal Exam	Students will sit a formal written examination at the end of the semester.	1,2,3	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
Laboratory	12 Weeks per Stage	2.00
Independent Learning Time	15 Weeks per Stage	5.13
	Total Hours	125.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_EEAER_B	Bachelor of Engineering (Honours) in Aerospace Engineering	7	Mandatory