

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	
<i>On successful completion of this module the learner should be able to:</i>	
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 <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
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

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
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