

AVIA H4604: Aircraft Stability and Control

Language of Instruction: English Credits: 5 NFQ Level: 8 Module Dolivered In 1programme(s) Teaching & Learning The module will be delivered with a biend 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 of aircraft stability and control, and how to apply techniques to predict and analyse an aircraft's stability, control and handing characteristics. Consuces Formulate the equations of motion for an aircraft in 2D flight, with focus on the stability and control properties. L02 Formulate the equations of motion for an aircraft in 2D flight, with focus on the stability and control derivatives. L03 Numerically predict and analyse the static and dynamic stability of an aircraft. L04 Analyse the static and dynamic stability of an aircraft. L05 No recommentations Trises are motores with have learning outcomes that are too similar to the learning outcomes of this module. No reconguistic Modules Iside with the iside on similar to the learning outcomes of this module. No reconguistic module iside with have learning outcomes that are too similar to the learning outcomes of this module. No reconguistic modules listed Keo	Module Title:			Aircraft Stability and Control	
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AVIA H4604: Aircraft Stability and Control

Module Content & Assessment

Indicative Content

Flight Mechanics review

ISA • equations of motion • drag performance.

Equations of Motion

• axis systems • equations of motion • linearisation • decoupling.

Stability and Control

• fundamentals of stability and control • aircraft static and dynamic stability • contribution of aircraft components to stability and control • trim • aircraft static and dynamic stability • longitudinal, lateral and directional stability • stick fixed and stick free • neutral point • stability augmentation • aircraft modes of motion.

Stability and Control Derivatives

· longitudinal derivatives · lateral derivatives · nondimensionalisation.

Control Systems

fundamentals as applied to aircraft • open and closed loop systems • reasons for using feedback • applications of feedback control to aircraft systems • state space representation.

Mathematical Modelling

• use of differential equations • use of Laplace Transforms • aircraft system transfer functions • poles and zeros • block diagrams • SISO and MIMO systems.

Time and Frequency Response

• transient and steady state responses • first and higher order responses • time delay • time response specifications • frequency response specifications • system gain in dB • bandwidth • bode plots • root locus method.

Sensitivity

• open and closed loop systems • parameter variations • disturbance rejection • sensitivity functions.

Flying and Handling Qualities

assessment of flying and handling qualities • aircraft natural modes • stability augmentation systems.

Flight Testing

• flight testing in a simulator • flight testing in a real live aircraft • flight test data capture and analysis.

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 Date Assessment Assessment Description Outcome % of Type addressed total Practical/Skills Students will carry out a number of laboratory sessions throughout the 1,2,3,4 30.00 Every 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: static and dynamic stability analysis; computer simulation tools and mathematical modelling; real time Evaluation Second Week flight analysis. A number of these laboratory sessions may take place in a simulated and/or a live aircraft flight environment.

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



AVIA H4604: Aircraft Stability and Control

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	8	Mandatory	