

No requirements listed

AVIO H3628: Helicopter Aerodynamics, Structures and Systems

Module Title:		Helicopter Aerodynamics, Structures and Systems			
Language of Instruction:		English			
Credits:	5				
NEO L sust	: 7				
NFQ Level	: /				
Module De	elivered In	No Programmes			
Teaching Strategies	& Learning	Lectures will be delivery using PowerPoint, handouts and interactive learning techniques.			
Module Ai	m:	To give the student the competency and skills set for helicopter flight systems and principles of operation.			
Learning (Outcomes				
On succes	sful completion of	f this module the learner should be able to:			
LO1	Discuss the p	scuss the principles and operation of helicopter flight control systems.			
LO2	Demonstrate	emonstrate and illustrate the principles of blade tracking and the role of vibration analysis as a tool in vibration reduction.			
LO3	Describe and explain the operation of the different types of helicopter transmission systems.				
LO4	Describe the different types of aircraft structures and how they are applied in helicopter construction.				
LO5	Describe and explain the different mechanical and electrical systems used on helicopters				
Pre-requis	site learning				
	ecommendation or learning (or a pi	s ractical skill) that is recommended before enrolment in this module.			
No recomm	nendations listed				
	ible Modules modules which h	ave learning outcomes that are too similar to the learning outcomes of this module.			
No incomp	atible modules lis	ted			
Co-requis	ite Modules				
No Co-req	uisite modules lis	ted			
Requirem This is price		ractical skill) that is mandatory before enrolment in this module is allowed.			



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Module Content & Assessment

Indicative Content

Flight Control Systems for Helicopters

Cyclic control; Collective control; Swash plate; Yaw control; Anti-torque Control, Tail rotor, bleed air Main Rotor Head: Design and Operation features; Blade Dampers: Function and construction; Rotor Blades: Main and tail rotor blade construction and attachment; Trim control, fixed and adjustable stabilisers; System operation: manual, hydraulic, electrical and fly-by-wire; Artificial feel; Balancing and Rigging.

Blade Tracking and Vibration Analysis

Helicopter Rotor alignment Main and tail rotor tracking; Static and dynamic balancing; Vibration types, vibration reduction methods; Ground resonance.MEMS sensors, intermediate transmissions, UAV transmission systems, main rotor mast indication systems, HUMS

Helicopter Transmission Systems

Gear boxes, main and tail rotors on helicopters; Clutches, free wheel units and rotor brake. Tail rotor drive shaft flexible couplings, bearings, vibration dampers and bearing hangers

Helicopter Airframe Structures

Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions; System installation provisions; Lightning strike protection provision. Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning and anti-corrosive protection. Pylon, stabiliser and undercarriage attachments; Seat installation; Doors: construction, mechanisms, operation and safety devices; Windows and windscreen construction; Fuel storage; Firewalls; Engine mounts; Structure assembly techniques: riveting, bolting, bonding; Methods of surface protection, such as chromating, Anodising, painting; Surface cleaning. Airframe symmetry: methods of alignment and symmetry checks.

Helicopter Air Conditioning systems

Air Supply – Sources of air supply including engine bleed and ground cart Air conditioning Air conditioning systems for small, mid and large helcopters Distribution systems; Flow and temperature control systems; Protection and warning devices.

Helicopter Equipment and Furnishings

Emergency equipment requirements; Seats, harnesses and belts; Helicopter cargo lifting systems Emergency flotation systems specific to helicopters Cabin lay-out, cargo retention; Equipment lay-out; Cabin Furnishing Installation. helicopter night flying systems, camera

Helicopter Fire Protection systems

Fire and smoke detection and warning systems on small to large helicopters Fire extinguishing systems; System tests.

Helicopter Fuel Systems

System lay-out; Fuel tanks; Supply systems for piston and jet powered helicopters Dumping, venting and draining; Cross-feed and transfer; Indications and warnings; Helicopter Refuelling and defuelling

Helicopter Hydraulic Power Systems
System lay-out on helicopters Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical, pneumatic; Emergency pressure generation; Pressure Control; Power distribution; Indication and warning systems; Interface with other systems. Indication and warning systems

Ice and Rain Protection Systems for Helicopters

Ice formation, classification and detection; Anti-icing and de-icing systems; electrical, hot air and chemical; Rain repellent and removal; Wiper systems Probe and drain heating.

Helicopter Landing Gear

Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, tyres, brakes; Steering; Air-ground sensing Skids, floats. for helicopters Wheels, tyres, brakes; slum pads

Pneumatic / Vacuum Systems for Helicopters

System lay-out; Sources: engine, compressors, reservoirs, ground supply; Pressure control Distribution on differnet helicopter configurations Indications and warnings; Interfaces with other systems

Integrated Modular Avionics (ATA42) for Helicopters

Functions that may be typically integrated in the Integrated Modular Avionic (IMA) modules are, among others: Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc. Core System; Network Components.

Helicopter On Board Maintenance Systems (ATA45)

Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring)

Helicopter Information Systems (ATA46)

The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. Includes units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. Does not include units or components installed for other uses and shared with other systems, such as flight deck printer or general use display. Typical examples include Air Traffic and Information Management Aircraft General Information System; Helicopter Flight Deck Information System; Helicopter Maintenance Information System; Passenger Cabin Information System; Miscellaneous Information System.

Assessment Breakdown	%
Continuous Assessment	10.00%
Practical	20.00%
End of Module Formal Examination	70.00%

Continuous Assessment				
Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Examination	Students will complete assignments as part of the assessment of this module.	1,3,5	10.00	Week 25

No Project

Practical				
Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Practical/Skills Evaluation	The student will complete a number of assignments during the module and write a report on each assignment	1,2,3,4	15.00	n/a
Practical/Skills Evaluation	The student will complete al test during the module.	2,3,5	5.00	n/a

No End of Module Formal Examination

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	Every Week	3.00		
Laboratory	Every Week	1.50		
Independent Learning Time	Every Week	2.00		
	Total Hours	6.50		