AVIO H3622: Power Plant

Module Title:	Power Plant
Language of Instruction:	English

Credits:	5

NFQ Level:	7

Module Delivered In	No Programmes

Teaching & Learning Strategies:	This module will be taught by lectures, demonstrations and practical tasks carried out by students on aircraft piston/gas turbine engines.

Module Aim:	The aim of this module is to introduce the student to the working principles of the gas turbine engine and engine indications systems as found on modern commercial aircraft.

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Explain the theoretical fundamentals of the gas turbine engine.
LO2	Understand the fundamentals of engine parameter sensing and indication.
LO3	Describe the operation of the inlet, compressor, combustion, turbine and exhaust sections in a Gas Turbine Engine.
LO4	Give a detailed description of the procedures for Gas Turbine Engine starting and ground run-up.
LO5	List the safety precautions to be observed when handling oils and fuels.

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
Fundamentals Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle; The relationship between force, work, power, energy, velocity, acceleration.
Constructional arrangement and operation of Gas Turbine Engines Turbojet, turbofan, turboshaft and turbopropeller engines. Compressor inlet ducts, Effects of various inlet configurations, Ice protection, axial and centrifugal compressors, fan balancing, Causes and effects of compressor stall and surge, methods of air flow control: bleed valves, variable inlet guide vanes, variable stator vanes, rotating stator blades. Compressor ratio. Combustion section features and principles of operation. Operation and characteristics of different turbine blade types, blade to disk attachment, nozzle guide vanes, causes and effects of turbine blade stress and creep. Convergent, divergent and variable area nozzles. Engine noise reduction, thrust reversers.
Ancillary Systems Operation of engine control and fuel metering systems including electronic engine control (FADEC); Systems lay-out and components. Operation of engine air distribution and anti-ice control systems including internal cooling, sealing and external air services. Operation of fire detection and extinguishing systems. Auxiliary Power Units (APUs): Purpose, operation, protective systems.
Starting and Ignition Systems Operation of engine start systems and components; Ignition systems and components; Maintenance safety requirements.
Engine Instrumentation Exhaust gas temperature/ Interstage turbine temperature systems, engine speed, engine thrust Indication: engine pressure ratio (EPR), engine Turbine Discharge pressure or jet pipe pressure systems, Oil pressure and temperature, Fuel pressure, temperature and flow, Manifold pressure, Engine torque and Propeller speed, Exhaust gas analysis.
Hybrid and Electric Propulsion Series and parallel hybrid systems, BLDC and AC synchronous motors, Battery Management Systems (BMS), Battery types, chemistry and characteristics, DC to DC converters, Motor Control Modules (MCM). Diagnostic systems.
Turbo-prop Engines Gas coupled/free turbine and gear coupled turbines; Reduction gears; Integrated engine and propeller controls; Overspeed safety devices.
Turbo-shaft engines Arrangements, drive systems, reduction gearing, couplings, control systems.
Lubricants and Fuels Properties and specifications; Fuel additives; Safety precautions.
Powerplant Installation and Ground Operation Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains. Procedures for starting and ground run-up; Interpretation of engine power output and parameters; Trend (including oil analysis, vibration and boroscope) monitoring; Inspection of engine and components to criteria, tolerances and data specified by engine manufacturer; Compressor washing/cleaning, Foreign Object Damage.

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*
Short Answer Questions	Each student will take an exam consisting of 20 short questions which shall be administered during term time.	1,2,3	10.00	n/a

No Project

Practical

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Each student will complete Gas Turbine Engine related practical tasks during the module and complete a mini project and report based one or more Engine Indicating Systems.	1,2,3,4,5	20.00	Sem 1 End

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.	1,2,3,4,5	70.00	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	Every Week	2.50
Tutorial	Every Week	0.50
Independent Learning	Every Week	2.00
	Total Hours	5.00