Subject Description Form

Subject Code	AAE4107
Subject Title	Aircraft Gas Turbine Engine Systems
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: AAE2102/IC2133 Aircraft Manufacturing and Maintenance Fundamentals
Objectives	To provide students with knowledge of aircraft gas turbine engine systems and application in engine monitoring and maintenance
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Acquire good understanding of aircraft turbine engine design and construction. b. Demonstrate good understanding of compressor stall/surge and its prevention. c. Apply their knowledge and skills to explain the limitations of aircraft gas turbine engines under normal and abnormal operational conditions.
Subject Synopsis/ Indicative Syllabus	**Basic Aircraft Turbine Engine Design and Construction** Constructional arrangement and operation of turbojet, turbofan, turboshaft, turboprop. **Compressor stall/surge** Causes and effects of compressor stall and surge and its prevention. **Bearings and Seal** Constructional features and principles of operation. **Lubricants and Fuel** Properties and specifications; Fuel additives; Safety precautions. **Lubrication Systems** System operation/lay-out and components. **Fuel Systems** Operation of engine control and fuel metering systems including electronic engine control (FADEC); systems lay-out and components.

	Air Systems Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services. **Starting and Ignition Systems** Operation of engine start systems and components; ignition systems and components; maintenance safety requirements **Engine Indication Systems** Exhaust gas temperature / interstage turbine temperature; engine thrust indication: engine pressure ratio, engine turbine discharge pressure or jet pipe pressure systems; oil pressure and temperature; fuel pressure and flow; engine speed; vibration measurement and indication; torque; power. **Power Augmentation Systems** Operation and applications; water injection, water methanol; afterburner 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. **Auxiliary power units (APUs)** Purpose, operation, protective systems. **Powerplant Installation** 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. **Engine Monitoring and Ground Operation** 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. **Engine Storage and Preservation** Preservation and depreservation for the engine and accessories / systems.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to aircraft gas turbine engines (outcomes a to c).

Tutorials are used to illustrate the applications of fundamental knowledge to practical situations (outcomes a to c).

Teaching/Learning Methodology	Intended subject learning outcomes to be covered		
	a	b	c
1. Lecture	✓	✓	✓
2. Tutorial	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Assignments / Quizzes	50%	✓	✓	✓
2. Final examination	50%	✓	✓	✓
Total	100 %			

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

0.5 × End of Subject Examination + 0.5 × Continuous Assessment

Examination is adopted to assess students on the overall understanding and the ability of applying the concepts. It is supplemented by continuous assessment including assignments and closed-book quizzes. The continuous assessment is aimed at enhancing the students' comprehension and assimilation of various topics of the syllabus.

Student Study Effort Expected

Class contact:	
▪ Lectures	36 Hrs.
▪ Tutorials	3 Hrs.
Other student study effort:	
▪ Assignments	20 Hrs.
▪ Self-study	46 Hrs.
Total student study effort	**105 Hrs.**

Reading List and References	1. EASA Module 15 Gas Turbine Engine, Aircraft Technical Book Co. 4th Edition 2. The Jet Engine, Rolls Royce, Latest Edition 3. Mattingly, J.D., Boyer, K.M., von Ohain, H., Elements of Propulsion: Gas Turbines and Rockets, AIAA, 2016. 4. Aircraft Powerplants, Bent & McKinley, McGraw-Hill, 4th Edition 5. Aircraft Gas Turbine engine Technology, Irwin E Tregar, McGraw-Hill, 2nd Edition 6. Thrust for flight, Thomson, W. (William), Longman, 2nd Edition 7. Aircraft powerplants., Kroes, Michael J.; Thomas W. Wild, McGraw-Hill, Ninth Edition. 8. Aero engine combustor casing : experimental design and fatigue studies, Panigrahi, Shashi Kanta; Niranjan Sarangi, Boca Raton, 2017 9. Axial Turbine Aerodynamics for Aero-Engines: Flow Analysis and Aerodynamics Design, Zou, Zhengping ; Wang, Songtao ; Liu, Huoxing ; Zhang, Weihao, Springer Singapore, 2018

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