Subject Description Form

Subject Code	AAE2003
Subject Title	Introduction to Aircraft Systems
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To develop students' knowledge and skill in the operation and design of essential mechanical and electrical systems in transport aircrafts.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the configurations and operating principles of essential aircraft systems; and b. Apply basic engineering skills to draft preliminary designs of essential aircraft systems.
Subject Synopsis/ Indicative Syllabus	**Aircraft Control Systems** – Principles of flight control, flight control surfaces (primary and secondary flight control), including ailerons, elevators, rudders, high lift devices, trim tabs, etc., flight control linkage systems, artificial feel systems, flight control actuation, etc. **Landing Gear Systems** – Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and auto braking; Tires; Steering; Air-ground sensing. **Engine Systems** – Principles of different types of engines, including turbojet, turbofan, turboshaft and turbo-prop engines; Engine coating structures; Engine constructions, including types and basic performance of Inlet, compressors, combustion section, turbine section and exhaust; Engine operation procedures; Engine performance. **Fuel Systems** – Characteristics of aircraft fuel systems; Aviation fuel; Fuel system components. Aircraft mass and payload. System lay-out; Fuel tanks; Supply systems; Fuel system operation modes. **Hydraulic Systems** – Hydrostatics; Flight control and utility functions, including emergency power sources, landing-gear system, braking and anti-skid; Hydraulic system components, including actuator, reservoir, piping, valve, pumps, filters; Hydraulic fluids; Power distribution. **Electrical Systems** – Characteristics of civil aircraft electrical system; Electrical load; power generation, including batteries, AC and DC power generations, emergency power generation; Power generation control, Inverters, transformers and rectifiers; Power distribution; Circuit protection; External / Ground power. **Atmospheric Condition** – Properties of air; The Earth's atmosphere; Definitions of different altitudes; Standard atmosphere; Atmospheric wind and turbulence.

Pneumatic Systems – Pneumatic system and components, including air supply, pressure regulation, air control, actuators; Pneumatic system used as actuators; Bleed air system, e.g., operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services; Pitot-static systems.

Environmental Control Systems – The need for cabin and equipment conditioning; Air conditioning system, including heating, cooling, humidity control; Air cycle and vapour cycle machines; Pressurization systems; Cabin noise; Anti-g system; Anti-icing, de-icing, rain dispersal, demisting systems;

Emergency system – Warning systems; Fire and smoke detection and warning systems; Emergency power source; Explosion suppression; Emergency oxygen; Passenger evacuation and crew escape; Crash recorder; Emergency landing.

Propeller – Fundamentals of Blade element theory. High / low blade angle, reverse angle, angle of attack, rotational speed; Propeller slip; Aerodynamic, centrifugal, and thrust forces; Torque; Relative airflow on blade angle of attack; Vibration and resonance; Speed control and pitch change methods.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to various aircraft systems.

Teaching / Learning Methodology	Intended subject learning outcomes to be covered	
	a	b
1. Lectures	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed	
		a	b
1. Attendance	5%	✓	✓
2. Assignment	15%	✓	
3. Mid-term test	15%	✓	
4. Course project	15%	✓	✓
5. Final examination	50%	✓	✓
Total	100 %		

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

Overall Assessment:

0.50 × End of Subject Examination + 0.50 × Continuous Assessment

	The final examination is adopted to assess students on their overall understanding of the concepts and their ability in applying the concepts. The continuous assessment consists of assignment, test and group project is aimed at enhancing students' comprehension and assimilation of various topics of the syllabus.	
Student Study Effort Expected	Class contact:	
	▪ Lectures	36 Hrs.
	Other student study effort:	
	▪ Week 7 reading week	3 Hrs
	▪ Self-study	30 Hrs.
	▪ Continuous assessments	39 Hrs.
	Total student study effort	108 Hrs.
Reading List and References	I. Moir and A.G. Seabridge, Design and Development of Aircraft Systems AIAA, 2020. I. Moir and A.G. Seabridge, Aircraft Systems: Mechanical, Electrical, and Avionics Subsystems Integration, 3rd edition, Wiley, 2011. J. Anderson, Introduction to Flight, 9th edition, McGraw Hill, 2021.	

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