Subject Description Form

Subject Code	AAE2001
Subject Title	Introduction to Aircraft and Aviation Systems
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To develop students' knowledge of the basic components and operating principles of essential mechanical and electrical systems in transport aircraft. 2. To provide a broad understanding of major aviation systems and their operations in the aviation industry.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Demonstrate good understanding of the principles of key systems in civil transport aircraft (e.g., control system, fuel system, engine system, hydraulic system, electrical system, pneumatic system, environmental control system and emergency system). b. Gain the basic knowledge of aviation systems and their functions in the aviation industry including the roles. c. Understand the interrelationships among civil aviation administration, airlines and airport operations; air traffic control; maintenance scheduling and aviation associated environmental issues.
Subject Synopsis/ Indicative Syllabus	***Fundamentals and Structure of Aviation System*** - An overview of the operations among civil aviation authorities, airlines, airports and aviation organizations including: • ***Civil Aviation Administration*** - Air services agreements. Air traffic management. Flight standards. Aviation safety and accident investigation. • ***Airline Operations*** - Flight planning and operations. Training of flight crew, aircraft engineers and supporting staff. Management of engineering operations. Flight simulator training. • ***Airport Operations*** – Basic anatomy of airport. Passenger and air cargo terminal operations. Airport security Operations. ***Flight Control Systems*** - Principles of flight control. Operation and effect of primary and secondary flight control systems, including ailerons and spoilers, elevators, stabilators, variable incidence stabilizers and canards, rudder, rudder limiter, high lift devices, drag inducing devices, trim tabs, servo tabs and control surface bias. ***Powerplant*** - Constructional arrangement and operation of turbojet, turbofan, turboshaft and turbo-prop engines; Types and basic performance of Inlet, compressors, combustion section, turbine section and exhaust. Fuel efficiency. Effect of specific thrust. Specific fuel consumption and flight speed. Engine cycle and performance.

	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. ***Landing Gear*** - Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and auto braking; Tires; Steering; Air-ground sensing ***Fuel Systems*** - Characteristics of aircraft fuel systems. Fuel system components. Aircraft mass and payload. System lay-out; Fuel tanks; Supply systems; Dumping, venting and draining; ***Hydraulic Systems*** - Flight control and utility functions. Emergency power sources. Landing-gear system. Braking and anti-skid. System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical, *pneumatic*; *Emergency pressure generation;* Filters; Pressure Control; Power distribution; ***Electrical Systems*** - Characteristics of civil aircraft electrical system. Batteries Installation and Operation; DC power generation; AC power generation, Electrical loads and Voltage regulation, Emergency power generation. Power distribution; Inverters, transformers, rectifiers; Circuit protection; External / Ground power. ***Pneumatic Systems*** - Pitot-static systems. Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services. Use of engine bleed air. Bleed air control. Thrust reversers. ***Environmental Control Systems*** - The need for cabin and equipment conditioning. Pressurization systems and Environmental control system design; Control and indication including control and safety valves; Cabin pressure controllers. Air distribution systems. ***Fire and Oxygen Emergency Systems*** - Warning systems. Fire and smoke detection and warning systems; Fire extinguishing systems; Portable fire extinguisher. Emergency oxygen- System lay-out: cockpit, cabin; Sources, Indications and warnings. ***Ice and Rain Protection Systems*** - Ice formation, classification and detection; Anti-icing systems: electrical, hot air and chemical; De-icing systems: electrical, hot air pneumatic and chemical. ***Air Conditioning System*** - Air cycle and vapour cycle machines; Distribution systems; Flow, temperature and humidity control system.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to various aircraft and aviation systems (outcomes a to c).

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

Industrial visits and special seminars delivered by invited industrial professionals are used to relate the concepts learnt on class to engineering practices. Students are expected to achieve better understanding of aircraft systems through these activities (outcomes a to c).

Teaching/Learning Methodology	Outcomes		
	a	B	c
Lecture	√	√	√
Tutorial	√	√	√
Industrial field visit and special seminar	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/ tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Examination	60%	√	√	√
2. Assignments and Quizzes	40%	√	√	√
Total	100%			

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

Overall Assessment:

0.60 × End of Subject Examination + 0.40 × 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, closed-book tests, industrial visits and special seminars. The continuous assessment is aimed at enhancing the students' comprehension and assimilation of various topics of the syllabus.

Student Study Effort Expected

Class contact:	
▪ Lecture/Seminar/Tutorial	39 Hrs.
Other student study effort:	
▪ Assignment/Min-Project/Report	22 Hrs.
▪ Self-study/Preparation	44 Hrs.
Total student study effort	**105 Hrs.**

Reading List and References	1. I. Moir amd A.G. Seabridge, Design and Development of Aircraft Systems – An Introduction, latest edition, AIAA Education Series, latest edition. 2. Alexander T. Wells and Seth B. Young, Airport Planning and Management, McGraw-Hill, latest edition. 3. Jon D. Fricker and Robert K. Whitford, Fundamentals of Transportation Engineering: A Multimodel Systems Approach, Prentice-Hall, latest edition. 4. Wittmer, Andreas, Bieger, Thomas, Müller, Roland (Eds.), Aviation Systems – Management of the Integrated Aviation Value Chain, Springer, latest edition. 5. Alan J. Stolzer, Carl D. Halford, John Joseph Goglia, Safety Management Systems in Aviation, Ashgate, latest edition. 6. Harry Kinnison, Aviation Maintenance Management, McGraw Hill, latest edition. 7. LeRoy Paine, Commercial Aviation—An Insider's Story, LifeRich, latest edition.

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