INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

AIRCRAFT SYSTEMS AND CONTROL								
VI Semester: AE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AAED27	Elective	L	T	P	C	CIA	SEE	Total
		3	0	-	3	40	60	100
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 48		
Prerequisite: Fluid Dynamics, Flight Mechanics								

I. COURSE OVERVIEW:

This course deals with concept and meaning of system and classifies the various systems required for aircraft and their contribution in order to fulfil the aircraft tasks. Describe the various types of Electrical power generations and distribution in aircraft. This course also helps student to get the knowledge of pneumatic, hydraulic and environmental control system, also describes different actuators, flight control system and advanced flight actuation system. This course introduces the electronic flight instrument systems available with advanced avionics. The course includes different adaptations involved in a military aircraft.

II. COURSES OBJECTIVES:

The students will try to learn

I. Impart the knowledge of pneumatic, hydraulic and environmental control system.
II. Describe the various types of Electrical power generations and distribution in aircraft.
III. Understanding basic measuring instruments and its significance, usage and importance
IV. Demonstrate different actuators, flight control system and advanced flight actuation landing and control systems.

III. COURSE OUTCOMES:

At the end of the course students should be able to:

CO 1 Understand the concept of aircraft Hydraulic, Pneumatic systems and its operations.
CO 2 Getting knowledge on electrical, air conditioning, pressurizing systems and its usage
CO 3 Discuss the concept of air and vapor cycles also describe operation and installation of air conditioning, pressurizing systems.
CO 4 Explain Principle of operation of aircraft engine control Fuel systems Control of fuel flow characteristics, components, operating modes
CO 5 Discuss the Operation and Principles of aircraft Instruments and Navigation Instruments
CO 6 Discuss the conventional and advanced aircraft navigation control systems

IV. COURSE CONTENT:

MODULE-I: AIRCRAFT SYSTEMS (8)

Hydraulic systems - Study of typical workable system - components - Hydraulic system controllers - Modes of operation - Pneumatic systems - Advantages - Working principles Typical Air pressure system – Brake system - Typical Pneumatic power system - Components, Landing Gear systems - Classification – Shock absorbers - Retractive mechanism.

MODULE-II: ELECTRICAL SYSTEMS AND AIR CONDITIONING, PRESSURIZING SYSTEMS (10)

Electrical loads in aircraft. Electrical power generation and control - DC, AC- types. Power distribution-primary, secondary.; Basic air cycle systems; Vapor cycle systems, boost-strap air cycle system; Evaporative Vapor cycle systems; Evaporative air cycle systems; Oxygen systems; deicing and anti-icing systems.

MODULE-III: ENGINE CONTROL AND FUEL SYSTEMS (10)

Principle of operation of aircraft gas turbine engines; Fuel systems for Piston and jet engines, - Components of multi engines. Lubricating systems for piston and jet engines - Starting and Ignition systems - Typical examples for piston and jet engines

Engine - airframe interfaces; Control of fuel flow, air flow, Fuel systems- characteristics, components, operating modes; Fuel tank safety- fuel inserting system.

MODULE-IV: AIRCRAFT INSTRUMENTS (10)

Flight Instruments and Navigation Instruments – Gyroscope - Accelerometers, Air speed Indicators – TAS, EAS- Mach Meters - Altimeters - Principles and operation - Study of various types of engine instruments - Tachometers - Temperature gauges - Pressure gauges - Operation and Principles.

MODULE-V: AIRPLANE CONTROL SYSTEMS (10)

Conventional Systems - Power assisted and fully powered flight controls - Power actuated systems – Engine control systems - Push pull rod system, flexible push full rod system Components - Modern control systems - Digital fly by wire systems - Auto pilot system active control Technology, Communication and Navigation systems Instrument landing systems.

V. TEXT BOOKS:

1. Moir I. and Sea bridge A, “Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration”, John Wiley, 3rd Edition 2008.
2. Moir I. and Sea bridge A, “Design and Development of Aircraft Systems - An Introduction”, AIAA Education Series, AIAA, 2004.
3. Pallett E.H.J, “Aircraft Instruments and Integrated Systems”, Longman Scientific &Technical 10th Edition, 1992.

VI. REFERENCE BOOKS:

1. “General Hand Books of Airframe and Power plant Mechanics”, U.S. Dept. of Transportation, Federal Aviation Administration, The English Book Store, New Delhi 1995.
2. Harris D, “Flight Instruments and Automatic Flight Control Systems”, 6th Edition, 2004.
3. Bolton W, “Pneumatic and Hydraulic Systems”, Butterworth-Heinemann.
4. McKinley J.L and Bent, R.D, “Aircraft Maintenance & Repair”, McGraw-Hill, 1993.

VII. ELECTRONICS RESOURCES:

1. https://www.aircraftsystemscomjet.com/
2. https://www.srmuniv.ac.in/sites/default/files/downloads/Aircraft_ctrl_Systems.pdf
3. https://hydraulicspneumatics.com/other-technologies/chapter-5-pneumatic-and-hydraulic-systems
4. https://www.stahl.de/fileadmin/Dateien/download_publikationen/webhavc_and_pressurization.

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open end experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper - II
9. Lecture notes
10. E-learning readiness videos (ELRV)
11. Power point presentation