

# AIRCRAFT SYSTEMS

## VI Semester: AE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
AAEB21	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: Nil</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 45</b>			

## OBJECTIVES:

**The course should enable the students to:**

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| I   | The basic objects oriented programming concepts and apply them in problem solving.  |
| II  | The fundamental concepts of computer programming, structure of the computational process and the basic approaches to the design of software applications. |
| III | The implementation of file processing, inter process communication and exception handling techniques  |
| IV  | To design and develop Graphical user interface using Applets and Swing/AWT concepts.  |

## COURSE OUTCOMES

**After successful completion of the course, students will be able to:**

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| CO 1  | <b>Demonstrate</b> the concept of aircraft system and its subsystems such as airframe systems, vehicle systems, and sub-systems for understanding operating principles of aircraft systems.      |
| CO 2  | <b>Identify</b> the mission requirements, and performance requirements of avionics systems, mission systems for better design and operation of aircraft systems.                                 |
| CO 3  | <b>Make use</b> of electrical power generation and control systems of Power distribution in primary and secondary control for Power conversion and energy storage                                |
| CO 4  | <b>Select</b> the basic air cycle and vapour cycle systems for obtaining additional cooling effect through evaporation.  |
| CO 5  | <b>Illustrate</b> the principal operation of hydraulic system its function, merits, application, design requirements and Hydraulic fluid properties for transforming the energy in landing gear. |
| CO 6  | <b>Explain</b> the working principles of pneumatic system and break management system in landing gear for quick and easy operation.  |
| CO 7  | <b>Demonstrate</b> the working principle of aircraft gas turbine engines its airframe interfaces for controlling of air and fuel flow in aircraft system   |
| CO 8  | <b>Interpret</b> the need of Fuel systems, its characteristics, safety and fuel inserting system for ensuring uninterrupted flow in the engine   |
| CO 9  | <b>Recall</b> the methods of flight, engine and modern control systems used in aircraft for safe and sustained flight.   |
| CO 10 | <b>Explain</b> the futuristic application of modern control system for enhancing aircraft performance, Modern control systems and autopilot system   |

<b>MODULE -I</b>	<b>INTRODUCTION TO AIRCRAFT SYSTEMS</b>	<b>Classes: 10</b>
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System concepts, sub-systems; Generic system definition, inputs, outputs, feedback, external influence. Aircraft systems- airframe systems, vehicle systems, avionics systems, mission systems and their sub-systems; Specification of requirements, mission requirements, performance requirements.

<b>MODULE -II</b>	<b>ELECTRICAL SYSTEMS AND AIR CONDITIONING, PRESSURIZING SYSTEMS</b>	<b>Classes: 10</b>
<p>Electrical loads in aircraft. Electrical power generation and control- DC, AC- types. Power distribution- primary, secondary. Power conversion and energy storage; Load protection; Electrical load management systems, 270 V DC systems;</p> <p>Basic air cycle systems; Vapour cycle systems, boost-strap air cycle system; Evaporative Vapour cycle systems; Evaporative air cycle systems; Oxygen systems; deicing and anti-icing systems</p>		
<b>MODULE -III</b>	<b>HYDRAULIC SYSTEMS AND PNEUMATIC SYSTEMS</b>	<b>Classes: 08</b>
<p>Hydraulic systems: function, merits, application, system loads, design requirements; Principal components; Hydraulic fluid: required properties; Hydraulic piping, pumps, reservoir, accumulator;</p> <p>Pneumatic systems ; Advantages;- Working principles ; Typical air pressure system ; Brake system; Typical pneumatic power system ; Components, landing gear systems ; Landing gear and brake management systems.</p>		
<b>MODULE -IV</b>	<b>ENGINE CONTROL AND FUEL SYSTEMS</b>	<b>Classes: 08</b>
<p>Principle of operation of aircraft gas turbine engines; Engine - airframe interfaces; Control of fuel flow, air flow, Limited authority control systems, full authority control systems- examples; Power off takes-need, types; Fuel systems- characteristics, components, operating modes; Fuel tank safety- fuel inserting system</p>		
<b>MODULE-V</b>	<b>AIRPLANE CONTROL SYSTEMS</b>	<b>Classes: 08</b>
<p>Flight control systems- primary and secondary flight control conventional systems; Power assisted and fully powered flight controls ; Power actuated systems; Engine control systems; Push pull rod system, flexible push full rod system; Control linkages, actuation- types, description and redundancy. Components; Modern control systems; Digital fly by wire systems, control laws, implementation; Auto pilot system.</p>		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. Moir, I. and Seabridge, A., —Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration, John Wiley, 3<sup>rd</sup> Edition 2008.</li> <li>2. Moir, I. and Sea bridge, A., —Design and Development of Aircraft Systems- An Introduction, AIAA Education Series, AIAA, 2004.</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Pallett, E.H.J., —Aircraft Instruments and Integrated Systems, Longman Scientific &amp; Technical 10<sup>th</sup> edition, 1992.</li> <li>2. Harris, D., —Flight Instruments and Automatic Flight Control Systems, 6<sup>th</sup> edition, 2004.</li> <li>3. Bolton, W., “Pneumatic and Hydraulic Systems”, Butterworth-Heinemann.</li> </ol>		
<b>Web References</b>		
<ol style="list-style-type: none"> <li>1. <a href="https://www.aircraftsystemscomjet.com/">https://www.aircraftsystemscomjet.com/</a></li> <li>2. <a href="https://www.srmuniv.ac.in/sites/default/files/downloads/Aircraft_ctrl_Systems.pdf">https://www.srmuniv.ac.in/sites/default/files/downloads/Aircraft_ctrl_Systems.pdf</a></li> <li>3. <a href="https://hydraulicspneumatics.com/other-technologies/chapter-5-pneumatic-and-hydraulic-systems">https://hydraulicspneumatics.com/other-technologies/chapter-5-pneumatic-and-hydraulic-systems</a></li> <li>4. <a href="https://www.stahl.de/fileadmin/Dateien/download_publicationen/web_havc_and_pressurization.pdf">https://www.stahl.de/fileadmin/Dateien/download_publicationen/web_havc_and_pressurization.pdf</a></li> </ol>		
<b>E-Text Books:</b>		
<ol style="list-style-type: none"> <li>1. <a href="https://www.amazon.in/Aircraft-Systems-Mechanical-ElectricalIntegration/dp/0470059966">https://www.amazon.in/Aircraft-Systems-Mechanical-ElectricalIntegration/dp/0470059966</a></li> <li>2. <a href="https://www.scribd.com/book/142412367/Aircraft-Systems-Mechanical-Electrical-and-Avionics">https://www.scribd.com/book/142412367/Aircraft-Systems-Mechanical-Electrical-and-Avionics</a></li> </ol>		