FLIGHT CONTROL LABORATORY

III Semester: AE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AAE107	Core	-	-	2	1	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 24				Total Classes: 24		

OBJECTIVES:

The course should enable the students to:

I. Learn the basic MATLAB simulation of un-accelerated flight for takeoff, cruise and landing conditions by solving equations of motions.
II. Understand the concept behind the conventional and unconventional airfoil performance and stability conditions.
III. Identify the functions of the basic controls like ailerons, elevators and rudders used in typical airplanes.
IV. Understand the dynamics of the aircraft flight simulator and it's functioning in different flight conditions like takeoff, landing and cruise condition.

COURSE LEARNING OUTCOMES (CLOs):

The students should enable to:

1. Learn the basics of MATLAB codes related to flight simulations.
2. Understand and simulate the effects altitude and temperature in International Standard Atmosphere (ISA).
3. Explain and simulate the Equations of Motions in one degree of Freedom (1-DOF).
4. Understand the application of Equations of Motions in 2-DOF.
5. Simulate the equations of motion by using MATLAB Software in 2-DOF.
6. Observe the Aerodynamic performance of a symmetrical airfoil by experiment.
7. Understand the impact of corrugated Airfoil in the study of aerodynamic performance.
8. Analyze the Aerodynamic performance and stability of a corrugated airfoil.
9. Evaluate the flight performance of a symmetrical airfoil.
10. Evaluate the flight stability and control of a symmetrical airfoil.
11. Analyze the flight performance of a corrugated airfoil.
12. Compare the performance of symmetrical and corrugated airfoil.
13. Analyze the Aerodynamic efficiency of a Delta wing aircraft.
14. Analyze the Aerodynamic stability of a Delta wing aircraft.
15. Analyze the takeoff and landing performance of airplane by using simulator and assessing difficulties.
16. Understand the concept of flight control application on the flight simulator operation to perform takeoff and landing.

LIST OF EXPERIMENTS	
Week-1	**MATLAB**
Introduction to flight with MAT LAB.	
Week-2	**ISA PROFILE FOR FLIGHT**
Determination of the International Standard Atmosphere (ISA).	
Week-3	**EQUATION OF MOTION IN 1-D**
Study of equation of motion with one degree of freedom by using simulating software.	
Week-4	**EQUATION OF MOTION IN 2-D**
Study of equation of motion with two degree of freedom by using simulating software.	
Week-5	**AERODYNAMIC PERFORMANCE STUDY OF A SYMMETRICAL AIRFOIL**
Study the aerodynamic performance of a symmetrical airfoil wing with varying angles of attack and velocity.	
Week-6	**AERODYNAMIC PERFORMANCE STUDY OF A CORRUGATED WING**
Performance test on a corrugated wing by using wind tunnel by varying angles of attack and Reynolds number.	
Week-7	**AERODYNAMIC PERFORMANCE STUDY OF A DELTA WING**
Performance test on a delta wing by using wind tunnel by varying angles of attack and Reynolds number.	
Week-8	**AERODYNAMIC STABILITY STUDY OF A SYMMETRICAL AIRFOIL**
Static stability analysis on a symmetrical airfoil by using wind tunnel by varying angles of attack and Reynolds number.	
Week-9	**AERODYNAMIC STABILITY STUDY OF A CORRUGATED WING**
Static stability analysis on a corrugated wing by using wind tunnel by varying angles of attack and Reynolds number.	
Week-10	**AERODYNAMIC STABILITY STUDY OF A DELTA WING**
Static stability analysis on a Delta wing by using wind tunnel by varying angles of attack and Reynolds number.	
WeeK-11	**FLIGHT SIMULATION OF TAKEOFF AND LANDING**
Study of the takeoff and landing performance on a flight simulator with constant wind condition.	
Week-12	**FLIGHT SIMULATION OF TAKEOFF AND LANDING AT DIFFERENT WIND CONDITIONS**

Study of the takeoff and landing performance on a flight simulator with varying wind condition.

Reference Books:

1. Anderson, J.D. Jr., "Aircraft Performance and Design", International Edition McGraw Hill, 1st Edition, 1999.
2. Yechout, T.R. et al., "Introduction to Aircraft Flight Mechanics", AIAA Education Series, AIAA, 1st Edition, 2003.