SEMESTER 7

ADVANCED FLIGHT MECHANICS

Course Code	**OEAOT725**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	**ESE Marks**	60
Credits	3	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	None	**Course Type**	Theory

Course Objectives:

Understand airplane performance and how aircraft respond to different flight conditions and changes.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Aircraft Speed Measurements and Drag Analysis: Measurement of speed & Mach number, True, Indicated and Equivalent air speed, Streamlined and bluff bodies, Various Types of drag in airplanes, drag polar curve, Equations of Motion – Forces Acting on the Aircraft	**9**
2	Airplane Performance - Steady Flight, Range, Endurance, Conditions for Maximum Range and Endurance, Climb Performance, Turn Performance, Maximum Load Factor During Turn. Glide Performance – Take-Off and Landing Performance. Comparison with Turbojets and Turboprop Performance Evaluation Guidelines	**9**
3	Static Stability :Degrees of freedom of a system, static and dynamic stability, static longitudinal stability, Contribution of individual components, neutral point, static margin, Hinge moment, Elevator control effectiveness, Aircraft equations of motion, stability derivatives, stability quartic, Phugoid motion	**9**
4	Dynamics : Yaw and side slip, Dihedral effect, contribution of various components, lateral control, aileron control power, strip theory, Aileron reversal, weather cock stability, directional control, rudder requirements,	**9**

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	dorsal fin, Dutch roll, spiral and directional divergence, autorotation and spin(descriptive)	

Course Assessment Method
(CIE: 40 marks,ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks (8x3 =24marks)	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. (4x9 = 36 marks)	60

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Course Outcomes (COs)

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

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the drag, power and thrust characteristics	K2
CO2	Understand the airplane performance across various operating conditions.	K2
CO3	Understand the contribution of individual components in the stability of an aircraft.	K2
CO4	Understand the static and dynamic response of aircraft for both voluntary and involuntary changes in flight conditions.	K2

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	-	-	-	-	-	2
CO2	2	2	-	-	-	-	-	-	-	-	-	2
CO3	2	2	-	-	-	-	-	-	-	-	-	2
CO4	2	2	-	-	-	-	-	-	-	-	-	2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Aircraft Performance and design	John D Anderson Jr.	McGraw-Hill Education	2017
2	Airplane Performance Stability and Control	Courtland D Perkins, Robert E Hage	John Wiley & Sons	1996
3	Flight stability and automatic control	Nelson R C	McGraw-Hill book Co	2004
4	Advanced Aircraft Flight performance	Filippone,Antonio	Cambridge university	2012

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Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Steady Aircraft flight and performance	N.Harris, McClamroch	Princeton University	2011
2	Theory and Practice of aircraft performance	Ajoy Kumar Kundu, Mark A Price,David Riordan	Wiley	2016
3	Dynamics of flight stability and control	Bernard Etkin, Lloyd Duff Reid	Wiley	3rd Edition,1996
4	Aircraft performance :An Engineering Approach	Mohammed H Sadraey	CRC Press	2023
5	Introduction to Flight	John D Anderson Jr	McGraw-Hill Education	Eighth Edition,2016

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://nptel.ac.in/courses/101106041
2	
3	
4	

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