GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

AIRCRAFT PERFORMANCE & STABILITY
(Code : 3360101)

Diploma Programme in which this course is offered	Semester in which offered
Aeronautical Engineering	SIXTH

1. RATIONALE

The main objective of this course is to understand the working of an aircraft performance and stability. This subject addresses the understanding of standard atmosphere, performance parameters, flight maneuvering and concept of aircraft stability.

2. LIST OF COMPETENCIES

The course content should be taught and implemented with an aim to develop different types of skills leading to the achievement of the following competencies:

- → **To know about standard atmosphere and different maneuvering flight conditions.**
- → **To study about details information of a flight mechanics.**

3. TEACHING AND EXAMINATION SCHEME.

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	**T**	**P**	**C**	**ESE**	**PA**	**ESE**	**PA**	**150**
04	01	00	05	70	30	20	30	

Legends: **L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** -Practical; **C** – Credit, **ESE** -End Semester Examination; **PA** - Progressive Assessment.

4. DETAILED COURSE CONTENTS

Unit	Major Learning Topics and Sub-topics	Outcomes (in cognitive domain)
UNIT– I INTRODUCTION TO FLIGHT	• To study about aircraft anatomy. • To study about aerodynamic factors for flight.	1.1 Airframe Anatomy 1.2 Airplane Axis System and Moment 1.3 Types of Airspeed 1.4 Critical Mach number and Drag Divergence Mach number 1.5 Swept Back Wing

UNIT– II STANDARD ATMOSPHERE	• To study about different types of altitude • To study about local gravitational constant and universal gravitational constant. • To study about standard atmosphere.	2.1 Types of Altitude 2.2 Relation between local gravitational constant and universal gravitational constant 2.3 Relation between Geometric Altitude (g) and Geopotential Altitude (g_0). 2.4 Layers of Atmosphere 2.5 International Standard Atmosphere
UNIT– III AIRCRAFT PERFORMANCE	• To study about aircraft performance parameters. • To study about Thrust required and power required conditions for flight • To study about Range and endurance for powered and unpowered flight	3.1 Drag Polar 3.2 Thrust Required for steady level flight 3.3 Minimum power required for cruise flight 3.4 Minimum Thrust and Minimum Power Required condition 3.5 Power available for aircraft engine 3.6 Rate of Climb for Steady flight 3.7 Absolute ceiling and service ceiling 3.8 Breguet formula for propeller driven Aircraft 3.9 Range and Endurance for Jet Powered aircraft
UNIT– IV MANUVERING FLIGHT	• To Study about various Flight maneuvering conditions. • To study about V-n diagram for flight.	4.1 Gliding Flight 4.2 Horizontal Turning Flight 4.3 Vertical Pull Up turn 4.4 Vertical Pull down turn 4.5 Spiral Turn Flight 4.6 V-n diagram
UNIT- V AIRCRAFT STABILITY	• To study about static stability and Dynamic Stability conditions. • To study about Wing alone configuration for stability. • To study about Canard as control surface.	5.1 Static Stability 5.2 Dynamic Stability 5.3 Criteria for longitudinal static Stability 5.4 Moment and Moment Coefficient about C.G. for Wing alone Configuration. 5.5 Neutral point and Static Margin. 5.6 Canard: Types and Stability

5. SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY).

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	INTRODUCTION TO FLIGHT	06	04	04	02	10
II	STANDARD ATMOSPHERE	07	05	03	06	14
III	AIRCRAFT PERFORMANCE	11	06	08	06	20
IV	MANUVERING FLIGHT	06	04	04	04	12
V	AIRCRAFT STABILITY	06	04	06	04	14
TOTAL		**36**	**23**	**25**	**22**	**70**

Legends: R = Remember **U**= Understand; **A**= Apply and above levels (Bloom's revised taxonomy

6. SUGGESTED LIST OF TUTORIALS.

The tutorial exercises should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the above mentioned competencies.

SR. NO.	UNIT NO.	TUTORIAL
1	I	To Study about Introduction of flight.
2	II	To Study about International standard Atmosphere.
3	III	To Study about Aircraft Performance.
4	IV	To Study about Flight Maneuvering.
5	V	To Study about Stability of Flight.

7. SUGGESTED LIST OF STUDENT ACTIVITIES.

Following is the list of proposed student activities like:

SR.NO. ACTIVITY

1 Preparation of power-point slides, which include videos, pictures, graphics for better understanding theory and experiment work.

2 Prepare a charts.

8. SUGGESTED LEARNING RESOURCES.

A. List of Books:

SR. NO.	TITLE OF BOOK	AUTHOR	PUBLICATION
1.	Introduction to Flight	J D Anderson	Mcgraw Hill Education
2.	Aircraft Performance and Design	J D Anderson	Mcgraw Hill Education
3.	Aircraft Performance and Stability Control	C D Perkins R E Hage	John Wiley & Sons
4.	Flight Stability and Automatic Control	Robert C Nelson	Mcgraw Hill Education

B. List of Software/Learning Websites

a. http://nptel.ac.in/courses/101104007/1

b. http://nptel.ac.in/courses/101106043/

c.https://www.youtube.com/watch?v=ATNEbnKxl98&list=PLPA2YbyQreSNVbvfhseeQoPls85Tn3aI3

d. https://www.youtube.com/watch?v=tEWuP1NVdgE

e. https://www.youtube.com/watch?v=vv7FcneohHg&list=PLthUARlELoUWD1nFEz5eVPN4BC6jlAqB

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnic.

- **Mr. Jaimin Varia,** Lecturer, Aeronautical Dept. Parul institute of Engg. & Tech.-Diploma studies
- **Mr. Karnail Saini,** Lecturer, Aeronautical Dept. Parul institute of Engg. & Tech.-Diploma studies
- **Prof. Ankitkumar Patel**, H.O.D., Aeronautical Dept. Parul institute of Engg. & Tech.-Diploma studies.

Faculty Members from Engineering.

- **Prof. Jignesh Vala,** Asst. Professor, Aeronautical Dept. SVIT, Vasad.
- **Prof. Arpit Patel**, Asst. Professor, Aeronautical Dept. SVIT, Vasad.