GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

INTRODUCTION TO AIRFRAME STRUCTURE
(Code : 3350103**)**

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

1. RATIONALE

The main objective of this course is to understand the structure of aircraft. This subject addresses the understanding and load associated with aircraft parts.

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 structures loads.**
- → **To study about details information of aircraft structure.**

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	00	02	06	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 study about basic structure of aircraft. • To study about load & stresses acting on aircraft.	1.1 History of aircraft structures 1.2 Component of aircraft structure 1.3 Major structural stresses 1.4 Types of loads 1.5 Load factors 1.6 Aerodynamics loads
UNIT– II MATERIALS FOR AIRCRAFT STRUCTURES	• To study about material for aircraft structure. • To study about	2.1 Metallic and non-metallic materials 2.2 Aluminum Alloys 2.3 Steel 2.4 Titanium

	properties of materials	2.5 Plastics 2.6 Glass 2.7 Composite Materials 2.8 Properties of Materials
UNIT– III AIRCRAFT COMPONENTS STRUCTURE	• To study about fixed wing aircraft structure. • To study about rotorcraft structure.	3.1 Fuselage Structure 3.2 Wing Structure 3.3 Empennage Structure 3.4 Flight Control Surface Structure 3.5 Landing Gear Structure 3.6 Helicopter Structures
UNIT– IV BASIC ELASTICITY	• To study about principle of stress. • To study about equation of equilibrium . • To study about principle of strain. • To study about Stress–Strain relationships. • To study about Compatibility Equations . • To study about Mohr's Circle of Strain.	4.1 Stress 4.2 Notation for Forces and Stresses 4.3 Equations of Equilibrium 4.4 Plane Stress 4.5 Boundary Conditions 4.6 Determination of Stresses on Inclined Planes 4.7 Principal Stresses 4.8 Mohr's Circle of Stress 4.9 Strain 4.10 Compatibility Equations 4.11 Plane Strain 4.12 Determination of Strains on Inclined Planes 4.13 Principal Strains 4.14 Mohr's Circle of Strain 4.15 Stress–Strain Relationships
UNIT– V DETERMINATE AND INDETERMINATE STRUCTURES	• To study about statically determinate & indeterminate structure.	5.1 Concept of statically Determinate and Indeterminate structure 5.2 Principal of super position, 5.3 Maxwell's Reciprocal Theorem.

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	07	06	03	03	12
II	MATERIALS FOR AIRCRAFT STRUCTURES	05	04	04	02	10
III	AIRCRAFT COMPONENTS STRUCTURE	08	08	06	04	18
IV	BASIC ELASTICITY	10	06	08	04	18
V	DETERMINATE AND INDETERMINATE STRUCTURES	08	06	04	02	12
TOTAL		**38**	**26**	**22**	**22**	**70**

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

6. SUGGESTED LIST OF EXERCISES/PRACTICALS.

The experiments 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.	EXPERIMENT	HOURS
1	II	Determination of young's modulus for metallic materials.	02
2	II	To study about materials for aircraft structures.	04
3	III	To study about structure of aircraft components.	04
4	V	Verification of superposition theorem.	02
5	V	Verification of Maxwell's reciprocal theorem.	02
6	V	To study about determinate and indeterminate structures.	02

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, animations, pictures, graphics for better understanding theory and experiment work.
2	Prepare charts of aircraft structure components.

8. SUGGESTED LEARNING RESOURCES.

A. List of Books:

SR. NO.	TITLE OF BOOK	AUTHOR	PUBLICATION
1.	Aircraft Structures for Engineering Students.	Thomas Henry Gordon Megson	Elsevier
2.	Structural Analysis Vol-1	S S Bhavikatti	Vikas Publishing House Pvt Limited
3.	Mechanics of Structure Vol. I	S. B. Junarkar	Charotar Publishing House Pvt. Limited

B. List of Software/Learning Websites

a. https://www.youtube.com/watch?v=isATVRTV0r4

b. https://www.youtube.com/watch?v=X8PhhtA4xxE

c. https://www.youtube.com/watch?v=eYRRTJsKbhU

d. https://www.youtube.com/watch?v=8fk2J5LtdSg

e. https://www.youtube.com/watch?v=FTUw0OWWMLU

f. https://www.youtube.com/watch?v=vDlgdnRgyL0&list=PLaDWa6xI4zefNlm7HrmpVen5g6A-4AgbB

g. https://en.wikiversity.org/wiki/Introduction_to_aircraft_components

h. http://aviationenglishblog.com/parts-of-an-aircraft/

i. http://www.sterlingaircraftmaterials.com/blog

j. http://aerospaceengineeringblog.com/aircraft-structures/

k. https://www.faa.gov/regulations_policies/handbooks.../aircraft/amt.../ama_ch01.pdf

l. 164.100.133.129:81/.../Uploads/ACD2501_Day%206_Aircraft_Structures.pdf

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnic.

- **Prof.Ankit Patel**, H.O.D., Aeronautical Dept. Parul institute of Engg. & tech-Diploma studies

Faculty Members from Engineering.

- **Dr.Dipali Thakkar**, H.O.D., Aeronautical Dept. Parul institute of Engg. & tech-Diploma studies

Coordinator and Faculty Members from NITTTR_Bhopal.