GUJARAT TECHNOLOGICAL UNIVERSITY

AERONAUTICAL ENGINEERING (01)
AIRCRAFT STRUCTURES II
SUBJECT CODE: 2150103
B.E. 5th SEMESTER

Type of course: Engineering Science

Prerequisite: Aircraft Structure - I, Basic concepts of Engineering Mechanics, Strength of Materials.

Rationale: Aircraft Structure – II is useful to apply fundamental principal of Mechanics to solve various field problems at higher level especially for computer programming.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Materials and Structural Components of Aircrafts: Basic construction techniques: its airframe and specific components along with their functions. Airframe loads: Types of load on aircraft and its parts in flight	4	20
2	Theory of Elasticity Basic elasticity, Notations, plane stress, plane strain, Two dimensional problems in elasticity: Stress functions, St Venant's principle, displacements	8	10
3	Thin walled beams Introduction to Symmetrical and Unsymmetrical Bending, Stress distribution, Position of neutral axis and deflections, calculation of section properties	8	20
4	Shear in beams Shear flow and shear center for open and closed section thin walled beams	7	20
5	Torsion of beams Introduction to torsion of solid sections, torsion of open and closed section beams	5	20
6	Matrix Method of Structural Analysis Introduction to Stiffness and Flexibility Method, application of system approach for the analysis of beams	4	10

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
40%	**30%**	**20%**	**05%**	**05%**	**-**

Reference Books:

1. Aircraft Structural Analysis - T H G Megson
2. Aircraft Structures – Lakshmi Narasaiah
3. Mechanics of Structure Vol. I & II: S. B. Junnarkar and H. J. Shah
4. Theory of Elasticity: Tiemo Shenko
5. Analysis of Structure Vol. II: S. S. Bhavikatti
6. Mechanics of Aircraft Structures: C. T. Sun
7. Matrix Analysis of Framed Structures –Weaver and Gere

Course Outcome:

After learning the course the students should be able to:

1 To know about basic concepts of analysis of aircraft structures and its requirements

List of Experiments:

1. Prerequisite of Aircraft Structure - II
2. Theory of Elasticity 1: Problems on Plane Stress and Plain strain
3. Theory of Elasticity 2: Stress function and St Venant's Principle
4. Unsymmetrical Bending - Measurements
5. Unsymmetrical Bending – Stress analysis
6. Example/s on Shear Centre – Open Section
7. Example/s on Shear Centre – Closed Section
8. Example/s on Torsion of solid section and thin walled sections
9. Matrix method 1: Analysis of Beam using Stiffness method
10. Matrix method 2: Analysis of Beam using Flexibility method

Design based Problems (DP)/Open Ended Problem:

Apart from above tutorial a group of students has to undertake 4 experiments given below.

1. Comparison of the wing structure of a transport carrier and a fighter
2. Making a model of a semi-monocoque structure
3. Making a model of a monocoque structure
4. Making a model of a wing structure showing ribs, spars, etc.
5. Making a model of a fuselage showing bulkheads, longerons etc.

Major Equipment: Basic apparatuses of Engineering Mechanics.

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.