AEROSPACE VEHICLE STRUCTURES – II

V Semester:

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
A5AE17	PCC	3	0	0	3	30	70	100

COURSE OBJECTIVES

The purpose of this subject is to provide the students with the theoretical background and engineering applications.

1. To analyse the Aerospace structures under major loading conditions
2. To conduct stress analysis on aircraft components

UNIT-I THIN PLATE THEORY, STRUCTURAL INSTABILITY

Analysis of thin rectangular plates subject to bending, twisting, distributed transverse load, combined bending and in-plane loading-thin plates having small initial curvature,energy methods of analysis.

UNIT-II BUCKLING OF THIN PLATES AND BENDING OF THIN-WALLED BEAMS

Buckling of thin plates-elastic, inelastic, experimental determination of critical load for a flat plate,local instability, Tension field beams- complete diagonal tension, incomplete diagonal tension.
Unsymmetrical bending- resolution of bending moments, direct stress distribution, position of neutral axis. Deflections due to bending-approximations for thin walled sections, temperature effects.

UNIT-III SHEAR AND TORSION OF THIN-WALLED BEAMS

Shear loaded thin Walled beams-general stress, strain and displacement relationships, direct stress, shear centre, twist and warping. Bending, shear, torsion of combined open and closed section beams.

UNIT-IV STRUCTURAL IDEALIZATION

Structural idealization-principal assumptions, idealization of panel, effect on the analysis of thin Walled beams Under bending, shear, and torsion loading-application to determining deflection.

UNIT-V STRESS ANALYSIS OF AIRCRAFT COMPONENTS- WING and FUSELAGE

Wing spars and box beams-tapered wing spar, beams having variable Stringer areas. Wings-Three-boom shell in bending, torsion, shear, tapered wings, deflections, cut-outs in wings. Bending, shear, torsion, cut-outs in fuselages, fuselage frames and wing ribs-principles of stiffener/ web construction, wing ribs**.**

Text Books:

1. Megson T. H. G (2012), Aircraft Structures for Engineering Students, 5th edition, Elsevier, New York.
2. 3E F Bruhn (1973), Analysis and Design of Flight Vehicle Structures, Tri-state Offset Company, USA

Reference Books:

1. *B. C. Punmia* (2011), Theory of Structures, 13th edition, *Laxmi* Publication, Hyderabad.
2. Timoshenko, Mechanics of Materials, CBS Publication

COURSE OUTCOMES:

At the end of the course the students are able to:

1 Illustrate the tension field and axial flow diagrams
2 Explain the failure stresses in plates and stiffened panels.
3 Demonstrate a shear loaded thin-walled beams- general stress, strain and displacement relationships- direct stress and shear flow system- shear centre, twist and warping
4 Distinguish between buckling of thin plates and deflections due to bending
5 Develop wing spars and box beams- tapered wing spar, open and closed section beam