Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2024-2025
Course Handout Part II

Date: 06-01-2025

In addition to part-I(General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : **AN F315 (L-P-T-U:3-0-0-3)**
Course Title : **Aircraft Structures**
Instructor-in-Charge : **Prof. Srinivasa Prakash Regalla**

Scope and Objective of the Course: Basic elasticity and 2D problems, Virtual work and energy method, Bending of thin plates, Structural components of aircraft, Airworthiness and airframe loads, Bending, Shear and Torsion of Thin-Walled Beams, Stress analysis of aircraft components including Wing spars and box beams, Fuselage, Wings, Fuselage frame and wing ribs, Laminated composite structures, Aeroelasticity, Computational Modelling of various Aircraft Components under Service Loads.

Textbooks:
1. Megson T.H.G., "Aircraft Structures for Engineering Students" Butterworth-Heinemann (Elsevier), 7th Edition, UK, 2022.
2. Sun C. T., Adnan A., "Mechanics of Aircraft Structures", 3rd Edition, Wiley, NJ, USA, 2021.

Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1-2	Basic elasticity and 2D problems	Elasticity of materials, stress-strain relations, stress function, membrane's analogy	CH1 to CH3 (TB)
3-6	Virtual work and energy method	Principle of virtual work, strain energy and complementary energy methods	CH4 &5 (TB)
7-10	Bending of thin plates	Pure bending and combined loading of thin plates, application of strain energy method	CH7 (TB)
11 -13	Structural components of aircraft	Loads on aircraft structural components, functions of structural components, fabrication of structural components, riveted joints and their design	CH12 (TB)
14 -17	Airworthiness and airframe loads	Factors of safety, load factor determination, airframe loads, symmetric maneuver loads, gust loads, design against fatigue	CH13 (TB)
18 - 21	Bending, Shear and Torsion of Thin-Walled Beams	Symmetric and unsymmetric bending, deflection	CH16 (TB)

22 - 27	Stress analysis of aircraft components:	Open and closed section beams in aircraft, beams with variable stringer areas	CH10 (TB)

	Wing spars and box beams		
28 - 31	Stress analysis of aircraft components: Fuselage, Wings, Fuselage frame and wing ribs	Fuselage bending, shear and torsion, pressurized fuselages	CH17 (TB)
32 - 35	Laminated composite structures	Laminated composites and thin-walled composite beams	CH16 (TB)
36-39	Aeroelasticity	Wing flutter, control effectiveness, aileron effectiveness	CH29 (TB)
40-43	Computational Modelling of various Aircraft Components under Service Loads	Matlab-based stress analysis and design of aircraft structures	CH6 (TB)

Evaluation Scheme:

Component	Duration (min)	Weightage(%)	Date & Time	Nature of Component
Mid-semester Examination	90	30%=60M	06/03 4.00 - 05.30PM	Closed Book
Design Project + Seminar	-	10%=20M		Open Book
Classroom Interaction Quizzes (CIQs)	10-30 min each	15%=30M	In the lecture class	Open Book
Comprehensive Examination	180	45%=90M	09/05AN	Closed Book

Chamber Consultation Hour: To be announced in the first lecture class.
Notices: LMS

Make-up Policy: Only for Mid-semester and Comprehensive examinations and only in genuine cases of illness with prior intimation with medical documents enclosed.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and any type of academic dishonesty is not acceptable.

INSTRUCTOR-IN-CHARGE