

<b>6<sup>th</sup> Semester</b>		<b>Aircraft Structures-II</b>	<b>L-T-P 3-0-0</b>	<b>3 Credits</b>
--------------------------------	--	-------------------------------	------------------------	------------------

**Module I                      SHEAR FLOW IN OPEN SECTIONS                      8 Hours**

Thin walled beams, Concept of shear flow and shear centre, Elastic axis. Shear flow in single and multi- cell under bending with walls effective and ineffective, one axis of symmetry, unsymmetrical beam sections. Structural constraint, Shear stress distribution in constrained open sections

**Module II                      SHEAR FLOW IN CLOSED SECTIONS                      9 Hours**

Bredt - Batho formula, Shear flow in single and multi – cell closed structures under bending and torsion with walls effective and ineffective in bending, approximate methods, Shear stress distribution in constrained closed sections, Warping of beams due to torsion, Shear lag of different constrained beams

**Module III                      ANALYSIS OF WINGS AND FUSELAGE                      10 Hours**

Basics of aircraft components and functions of parts, Construction concepts for fuselage, wing, control surfaces and tail plane. Analysis of fuselage structures for bending, shear and torsional loads. Analysis of fuselage frames, cut outs in fuselages. Analysis of multi-cell wing structures for bending, shear and torsional loads. Method of successive approximation, analysis of ribs, cut outs in wings.

**Module IV                      ANALYSIS OF WING SPAR                      7 Hours**

Types of spar construction, diagonal tension concept, semi-diagonal tension concept, design of spar web: shear resistant, diagonal tension, semi-diagonal tension web. Analysis of parallel and tapered spar cab

**Module V                      AIRCRAFT FITTINGS AND CONNECTIONS 7 Hours**

Types of aircraft fittings, Wing to spar attachments, Single bolt fittings, Multi-bolt fittings, Bolt group analysis, Shear, bending and tensile failures of bolts, Analysis of lugs to normal and oblique loadings. Riveted connections and strength of rivets.

**Books:**

1. T.M.G. Megson, "Aircraft Structures for Engineering Students", Fifth edition, Butterworth, Heinemann, 2012.
2. E.H. Bruhn, "Analysis and Design of Flight Vehicles Structures", Tri-state off- set company, USA, 1985.
3. D.J. Peery and J.J. Azar, "Aircraft Structures", 2nd edition, McGraw – Hill, N.Y., 1999.
4. S. Timoshenko and D.H. Young, "Elements of strength materials Vol. I and Vol. II"., T. Van Nostrand Co-Inc Princeton-N.J. 1990.

5. B.K. Donaldson, "Analysis of Aircraft Structures - An Introduction", Second edition, Cambridge University Press, 2012.
6. Howard D Curtis, 'Fundamentals of Aircraft Structural Analysis', WCB- McGraw Hill, 1997.
3. R.M. Rivello, "Theory and Analysis of Flight Structures", McGraw Hill, 1993.

### **Digital Learning Resources**

Course Name: High Speed Aero Dynamics

Course Link: <https://nptel.ac.in/courses/101/105/101105024/>

Course Instructor: Prof. Dr. K.P. Sinhamahapatra, IIT Kharagpur

<https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-20-structural-mechanics-fall-2002/>