



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with "A" Grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 / 51 / 52 / 54 / 55 Fax: 044 - 2450 2344
www.sathyabama.ac.in



SAEA3001	THEORY OF ELASTICITY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts and basics of Theory of Elasticity and its principles.
- To evaluate the characteristics of structural members.
- To know the basic methods to solve the solid mechanics problems.
- To discuss the structural mechanics and its applications.

UNIT 1 INTRODUCTION

9 Hrs.

Definition, notations and sign conventions for stress and strain – Stress - strain relations, Strain-displacement relations- Elastic constants. Coordinates and Tensors Transformation. Stress in Cartesian Coordinates. Principal Stresses and Principal Coordinates. Stress Ellipsoid.

UNIT 2 BASIC EQUATIONS OF ELASTICITY

9 Hrs.

Generalized Hooke's Law. Relationships between Elastic Moduli. Boundary-Value Problems in Elasticity. Navier's Equations. Beltrami-Michelle's Equations. Saint-Venant's Principle.

UNIT 3 2D AND 3D PROBLEMS OF ELASTICITY

9 Hrs.

Plane stress and plain strain problems - Airy's stress function in polar and Cartesian coordinates. Biharmonic equations – 2- D Problems Cantilever and simply supported beams. Torsion of a Circular Shaft. Bending of a Prismatic Bar. Thermo Elasticity-General Approach- Plane Thermoelastic Problem in Polar Coordinates.

UNIT 4 TORSION

9 Hrs.

Torsion of a uniform circular shaft. Torsion of Elliptical and Triangular Sections Bars. Torsion of Hollow Bars. Prandtl's Theory-Membrane analogy.

UNIT 5 THERMAL STRESS AND ELASTIC STABILITY

9 Hrs.

Thermo elastic stress strain relations, equations of equilibrium, thermal stresses in thin circular discs and in long circular cylinders. Euler's column buckling load: clamped-free, clamped-hinged, clamped-clamped and pin-ended, Numerical Problem.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to

- CO1 - Recall history and basics of Theory of Elasticity and its principles.
- CO2 - Compare the mathematical modeling and numerical methods.
- CO3 - Understand the working methodology of Theory of Elasticity.
- CO4 - Recognize the various functions of approximation methods.
- CO5 - Analyze the quality of structural grids and suitable shapes and methods for it.
- CO6 - Distinguish the problems application based.

TEXT / REFERENCE BOOKS

1. Timoshenko S.P. and J.N. Goodier, Theory of Elasticity, McGraw-Hill, 2010.
2. Sechler E, "Elasticity in Engineering" John Wiley & Sons Inc., New York, 1980.
3. Ugural, A.C and Fenster, S.K, Advanced Strength and Applied Elasticity, Prentice hall, 2003
4. Wang, C.T. Applied elasticity, McGraw Hill 1993.
5. Enrico Volterra and Caines, J.H, Advanced strength of Materials, Prentice Hall, 1991.



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SAEA3003	AIRFRAME MAINTENANCE AND REPAIR PRACTICES	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

- To make the students to understand the Airframe components and the tools used to maintain the components. Defect investigation, methods to carry out investigation and the detailed maintenance and practice procedures.

UNIT 1 SAFETY PRACTICES

9 Hrs.

Safety – Importance of Flight Safety, Maintenance of Ground Support Equipments, refueling, de-refueling, fire equipments, Hazardous materials storage and handling, Environmental and shop cleanliness – precautions, Aircraft furnishing -practices, Equipments, Hazard zones.

UNIT 2 REVIEW OF HYDRAULIC AND PNEUMATIC SYSTEM

9 Hrs.

Trouble shooting theory and Procedure, Inspection and maintenance of Hydraulic, Pneumatic, Fuel, Landing gear, Inspection and maintenance of Air conditioning, Pressurization systems Oxygen, De-icing, Fire Protection Installation and maintenance of instruments – Handling - Testing – Inspection, Position and warning system Auxiliary Power Units (APUs).

UNIT 3 AIRCRAFT JACKING, ASSEMBLY AND RIGGING

9 Hrs.

Airplane, Jacking and Weighing and C.G. Location .Rigging of control surfaces – Inspection, maintenance. Helicopter flight controls, Tracking and balancing of main rotor.

UNIT 4 MAINTENANCE OF AIRCRAFT STRUCTURAL COMPONENTS

9 Hrs.

Equipments Used In Welding Shop And Their Maintenance – Ensuring Quality Welds – Welding Jigs And Fixtures – Soldering And Brazing – Laser Welding. Sheet Metal Repair And Maintenance: Selection Of Materials; Repair Schemes; Fabrication Of Replacement Patches; Tools – Power/Hand; Repair Techniques; Peening – Close Tolerance Fasteners; Sealing Compounds; Forming/Shaping; **Calculation Of Weight Of Completed Repair; Effect Of Weight – Change On Surrounding Structure.** Sheet Metal Inspection – N.D.T. Testing. Riveted Repair Design – Damage Investigation – Reverse Engineering.

UNIT 5 PLASTICS AND COMPOSITES IN AIRCRAFT

9 Hrs.

Review of Types of Plastics Used In Airplanes – Maintenance And Repair of Plastic Components – Repair of Cracks, Holes Etc., Various Repairs Schemes – Scopes. Cleaning of Fibre Reinforced Plastic (FRP) Materials Prior To Repair; Break Test – Repair Schemes; FRP/Honeycomb Sandwich Materials; Laminated FRP Structural Members And Skin Panels; Tools/Equipment; Vacuum-Bag Process. Special Precautions – Autoclaves.

Max. 45 Hrs.

COURSE OUTCOMES

- On completion of the course, students will be able to
- CO1 - Understanding importance of Flight Safety, Maintenance of Aircraft Equipments.
 - CO2 - Understanding Hydraulic and pneumatic system.
 - CO3 - Understanding Aircraft Jacking, Assembling and Rigging procedures.
 - CO4 - Understanding the maintenance of Aircraft structural components.
 - CO5 - Analysis of plastic and composite materials used in aircraft.
 - CO6 – Familiarize in handling the composite material repair works.

TEXT / REFERENCE BOOKS

1. Larry Reithmeir, Aircraft Repair Manual – Palamar Books, Marquette, 2012.
2. Brimm D.J. Bogges H.E., Aircraft Maintenance – Pitman Publishing Corp. New York, 2011.
3. Howard Curtis, Antonio Fillippone, Aerospace Engineering Reference, Butterworth – Heinmann, 2012.
4. Micheal .J. Kroes, James .R. Rardon, Aircraft : Basic Science with Student Study Guide, McGraw Hill, 2011.



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5. Delp. Bent and Mckinely "Aircraft Maintenance Repair", McGraw Hill, New York, 1987.