

Design of Lightweight Structures



Note

Please do not make your travel arrangements until you receive an Invoice from us.

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ABOUT THE COURSE

The modern trend in selection of materials for high strength-weight ratio is governed by the growing need for low-cost high performance structures. The amount of material has a direct bearing on cost. Therefore the first step towards the cheapest structure is to minimise the weight without disproportionately affecting the fabrication cost.

The main application for materials possessing high strength-weight ratio are in structural engineering, transport and portable appliances. Cost savings is one of the criteria for successful structural engineering and transport application. The use of strong but light-weight members helps to achieve this in that the overall stress levels in a construction are reduced together with handling, manipulation and pay-load cost. These factors are important in such applications as bridges, ships, high speed vessels, rail and transport carriers.

As light-weight applications mean the use of strong but low-density materials, alloys of aluminium are generally used. However, new approaches in fabrication techniques are leading to high use of fibre-reinforced plastics.

This course will deal mainly with structures with FRP/GRP materials and aluminium.

WHO SHOULD ATTEND

Engineers and scientists involved in the design, operation and assessment of composite structures and their associated equipment. Personnel from oil companies, consultancy organisations, classification societies and certifying authorities will benefit from attending this course.

PROGRAMME

Day 1

08:30 - 09:00	Delegate Registration
09:00 - 10:30	Lecture 1: Introduction to Composite Materials
10.30 -11:00	<i>Break</i>
11:00 -12:30	Lecture 2: Fundamentals of Composite Structures
12:30 – 13:30	<i>Lunch</i>
13:30 -15:00	Lecture 3: Selection of Composite Materials
15:00 -15:30	<i>Break</i>
15:30 -17:00	Lecture 4: Analysis & Design of Composite Structures

Day 2

09:00 -10:30	Lecture 5: Introduction to Aluminium Structures
10:30 - 11:00	<i>Break</i>
11:00 – 12:30	Lecture 6: Design for Buckling & Strength
12:30 – 13:30	<i>Lunch</i>
13:30 – 15:00	Lecture 7: Application of Composites in Industrial Structures – I
15:00 – 15:30	<i>Break</i>
15:30 – 17:00	Lecture 8: Application of Composites in Industrial Structures – II
17:00	<i>Closure</i>

Lecture Content:

Lecture 1: Introduction to Composite Materials:

Introduction: Products & Structures - Basic Definitions and Classifications – Constituent materials and types of composites – Reinforcements and Fillers –

Lecture 2: Fundamentals of Composite Structures:

Mechanics of Composite Structures – Linear elastic Stress-Strain characteristics of FRP Composites – Stress-Strain concepts in 3D – Anisotropic Elasticity – Plane stress 2D elasticity concept – Theory of Laminates

Lecture 3: Selection and Processing of Composite Materials

Selection criteria for Composite Materials Advantages and limitations of Composites – Comparison among the types of Composite materials and its applications – Manufacturing process of various Composite Structures – Testing methods – Codes & Guidelines for Design/Applications

Lecture 4: Analysis & Design of Composite Structures

Analysis by Finite Element methods for Composite material components – Material non-linearity in Composites – Failure mechanics in Composite Structures – FEA Software programs Design considerations: Material, Product and Manufacturing – Design of Material structure – Design for Function – Design of adhesively bonded joints – Design of Sandwich Structures

Lecture 5: Introduction to Aluminium Structures

Introduction to material properties of aluminium. Applications in various aspects. Different types of structural components such as stiffened plates, beam columns

Lecture 6: Design for Buckling & Strength for Aluminium Structures

Behaviour and performance of aluminium structures in different loading conditions.

Lecture 7: Application of Composites in Industrial Structures – I

Applications in Transportation systems, Civil Engineering Structures, Industrial, Aerospace and Health diagnostics

Lecture 8: Application of Composites in Industrial Structures – II

Applications in Offshore Oil and Gas, Sub-sea structural components, Onshore/Offshore Wind turbine components and in Defence