Short Course Programme

Composite Materials – Basics, Uses, Failure, Reliability and Durability

Introduction

Composite materials are now widely used in a range of critical load bearing applications, ranging from Formula 1 bodies to concrete bridges and dams. In addition to the high stiffnesses and strengths of some composite materials, their advantages include the capacity for being able to 'design', or tailor their properties for a particular application, and that the properties may be either isotropic, i.e. the same in all directions, or anisotropic, i.e. different properties in one direction to those in the other two perpendicular directions. Nearly all advanced composite materials are anisotropic, which means that the failure, reliability and durability are dependent not only on the **magnitude** of an imposed loading, but also on the **direction** of any such loading. Hence, this course will provide a basic appreciation of the compositions and structures of practical composite materials, whilst concentrating on their properties and failure mechanisms, with reference to the reliability and durability of components and systems that are reliant on composite materials.

Designed For

This course has been designed for practicing engineers, analysts and managers to provide a sound appreciation of composite materials and their failure mechanisms and mechanics.

Objectives

By the end of this course you will be able to:
■ Appreciate the different types of composite materials and their constituent material properties
■ Appreciate the differences between the analysis, design and failure of conventional isotropic materials, e.g. metallic alloys, and anisotropic composite materials
■ Understand the different failure mechanisms in composite materials and their influence on the design, analysis, reliability and durability of components and systems manufactured using composite materials

Content

■ **Composite Material Structures**
- Fibre Composites
- Particulate Composites
- Laminated composites

■ **Properties of Practical Composite Materials**
- Fibres
- Particulates
- Matrices
- Fibre/Particulate – Matrix bonding

■ **Design of Composite Material Properties**
- Design for Stiffness
- Design for Strength
- Design for Toughness/Impact

■ **Materials Manufacturing Techniques**
- Overview of Fibre Composite Manufacturing
- Overview of Particulate Composite Manufacturing
- Overview of Laminate Composite Manufacturing

■ **Failure Mechanisms and Mechanics**
- Isotropic and Anisotropic Failure Criteria
- Tensile failure
- Compression failure
- Shear failure
- Impact failure
- Environmental degradation and failure

■ **Reliability Analysis of Failure Data**
- Weibull Method (analytical and graphical)

■ **Durability Prediction**
- Expected Time To Failure
- 5% and 95 % Life expectancy

■ **Advanced Topics**
- Optimal Design of Composite Materials
- Numerical Analysis of Composite Materials
- 'Smart' Composites
- 3-D fibre composite manufacturing

Key Information	
Dates	Please see www.mirceakademy.com
Time	0900 – 1700
Venue	Woodbury Park Hotel, Golf and Country Club –approximately eight miles by road from Exeter (the nearest major city).
Cost	Please see www.mirceakademy.com
Accommodation	Accommodation is not included in the course fee. Participants are responsible for the arrangement and payment of their accommodation. Reduced rates are available at Woodbury Park Hotel – contact Woodbury Park Hotel Reservations direct requesting the 'MIRCE' rate. Contact details are – Woodbury Park Hotel, Golf and Country Club, Woodbury, Exeter, EX5 1JJ, United Kingdom Tel +44 (0) 1395 233 382 Fax +44 (0) 1395 233 384 Email enquiries@woodburypark.co.uk Web www.woodburypark.co.uk A list of alternative accommodation in other hotels and guesthouses in the area of the course venue is available from MIRCE Akademy on request.
Booking	Please complete a Booking Form for each participant and return it to MIRCE Akademy – available to download at www.mirceakademy.com under heading Communication and Training.

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