

**TRAINING TITLE**

**KNOWLEDGE OF MATERIALS, COMPOSITE MATERIALS AND TESTING EQUIPMENT**

**Training Duration**

5 day

**Training Venue and Dates**

Ref. No. PE085	Knowledge of Materials, Composite Materials and Testing Equipment	5	12-16 May 2025	\$5,500	DUBAI, UAE
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In any of the 4 or 5-star hotels. The exact venue will be informed later.

**Training Fees**

- \$5,500 per participant for Public Training includes Materials/Handouts, tea/coffee breaks, refreshments & Lunch

**Training Certificate**

**Define** Management Consultants Certificate of course completion will be issued to all attendees.

**TRAINING DESCRIPTION**

This 5-day training course is designed to provide participants with in-depth knowledge of materials science, focusing on composite materials and their testing techniques. The course covers the types, properties, and applications of both traditional and advanced materials, with a special emphasis on composite materials used in industries such as aerospace, automotive, construction, and energy.

**TRAINING OBJECTIVES**

**By end of course participants will be able to understand**

- **Understand the basic principles** of materials science, including structure, properties, and behavior of materials.
- **Identify and describe various types of composite materials**, including thermosets, thermoplastics, and reinforced composites.
- **Comprehend the key factors** that influence material selection for different engineering applications.
- **Learn about the different testing methods** used to evaluate the mechanical, thermal, and chemical properties of materials.
- **Understand the role of material testing equipment**, including universal testing machines, hardness testers, and impact testers.

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- **Interpret material test results** to assess material performance and suitability for specific applications.
- **Apply appropriate testing standards** (e.g., ASTM, ISO) in conducting material tests.
- **Identify common failure modes** in materials and composites and how to prevent them through proper testing and material selection.

### WHO SHOULD ATTEND?

- Materials Engineers and Technicians
- Product Designers and Manufacturing Engineers
- Quality Control Managers
- R&D Engineers
- Project Managers
- Students and Professionals

### COURSE PROGRAM

#### **Day 1: Introduction to Materials Science**

- Overview of materials science: Definition and scope.
- Classification of materials: Metals, polymers, ceramics, and composites.
- Basic atomic structure and properties of materials (e.g., mechanical, thermal, electrical).
- Key factors affecting material performance (stress, strain, fatigue, creep).
- Types of materials: Ferrous and non-ferrous metals, polymers, ceramics, and composites.
- Material properties and how they are measured.
- Introduction to composites: Structure, types, and applications.
- Industry examples of material selection in various sectors (aerospace, automotive, construction).

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#### **Day 2: Composite Materials – Types and Properties**

- Introduction to composite materials: Definition, structure, and types (fibers, matrices, and reinforcements).
- Types of composites: Polymer matrix composites (PMCs), metal matrix composites (MMCs), ceramic matrix composites (CMCs).
- Key properties of composite materials: Strength, stiffness, thermal resistance, fatigue resistance.
- Common materials used in composites: Carbon fiber, glass fiber, aramid, and natural fibers.

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- Manufacturing processes for composite materials: Lay-up, filament winding, resin transfer molding (RTM), and autoclave processing.
- Advantages and limitations of composite materials.
- Design considerations for composite materials in various applications (aerospace, automotive, sports equipment, etc.).

### **Day 3: Material Testing Methods and Equipment**

- Overview of material testing: The importance of testing for material selection and quality control.
- Common mechanical tests: Tensile, compression, shear, and bending tests.
- Hardness testing: Methods and standards (e.g., Rockwell, Vickers, Brinell).
- Impact testing: Charpy and Izod tests for ductility and toughness.
- Thermal testing methods: Differential scanning calorimetry (DSC), thermal conductivity, and expansion.
- Non-destructive testing (NDT) methods: Ultrasound, X-ray, and Eddy current testing for composites.
- Introduction to universal testing machines (UTMs) and how they work.

### **Day 4: Advanced Testing for Composites and Failure Analysis**

- Testing composite materials: Special considerations for fiber-reinforced composites.
- Methods for testing composite lamina and laminate properties.
- Testing for damage tolerance: Fatigue and environmental exposure testing (UV, moisture, temperature).
- Microstructure analysis: Scanning electron microscopy (SEM) and other imaging techniques for composites.
- Failure modes in composite materials: Delamination, fiber breakage, matrix cracking, and debonding.
- Failure analysis techniques: Fractography and microscopy.

### **Day 5: Data Interpretation, Reporting, and Industry Standards**

- Interpreting test results: Stress-strain curves, hardness values, impact energies.
- Using material data sheets and test reports.
- Applying industry standards: ASTM, ISO, and MIL standards for material testing.
- Ensuring accuracy in reporting: Data validation and quality assurance.
- Review of composite materials and their testing techniques.
- Advanced topics: Sustainability in composite materials and recycling.
- Q&A session and course wrap-up.

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**NOTE:**

**Pre-& Post Tests will be conducted.**

**Case Studies, Group Exercises, Group Discussions, Last Day reviews, and assessments will be carried out.**

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