MERCURY

# Strength of Materials Course

20 – 24 December 2026
Cairo (Egypt)



Dubai - UAE: +971 4 450 5697
Istanbul - Türkiye: +90 539 599 1206
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# Strength of Materials Course

**Ref:** 15295_279130 **Date:** 20 – 24 December 2026 **Location:** Cairo (Egypt) **Fees:** 4000 Euro

## Introduction:

This strength of materials program provides in-depth knowledge about material strength's science and engineering aspects. It delves into the tests conducted in this domain, their practical applications, and their scientific relevance. Understanding material strength is foundational for fields requiring structural integrity and safety assurance.

This static and strength of materials course aims to enrich participants with a comprehensive understanding applicable to construction, design, and manufacturing processes. It delicately focuses on public safety and the importance of material strength in practical life.

Strength of materials mechanical engineering in The course will benefit graduates from various engineering backgrounds, including Aeronautical, Mechanical, Civil, and Marine, as well as those involved in oil and gas extraction.

This strength of materials program provides an in-depth understanding of the concept of the strength of materials and its application on the ground in practical life, the benefits from it in public life, the use of this science in public safety in practical life in construction, design and manufacturing processes and the role of this science in the field.

## Importance of Strength of Materials:

Understanding and applying the principles of strength of materials is crucial for ensuring the reliable performance of structures and components under various loads and conditions. By mastering these concepts, engineers can design and maintain safe, efficient, and durable systems that withstand the tests of time and usage.

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## Targeted Groups:

- Civil Engineers.
- Mechanical Engineers.
- Structural Engineers.
- Material Scientists.
- Aerospace Engineers.
- Automotive Engineers.
- Construction Managers.
- Maintenance Engineers.
- Quality Control Engineers.
- Research and Development Engineers.
- Industrial Engineers.
- Engineering Students.

## Course Objectives:

At the end of this strength of materials course, the participants will be able to:

- Introduction to the strength of materials.
- Learn about the 12 scientific experiments within the framework of material resistance.
- Practical application of each experiment in engineering and its relevance to specific engineering fields.
- Identification and usage of the equipment employed in these experiments.
- Explanation of the benefits and importance of applying these experiments in real-world scenarios.
- Achieve a well-rounded understanding of the strength of materials and their underlying scientific principles.

## Targeted Competencies:

By the end of this strength of materials training, the participant's competencies will:

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- Understand Material Properties.
- Analyze Stresses and Strains.
- Assess Material Failures.
- Apply Elasticity Theory.
- Conduct Material Testing.
- Evaluate Structural Integrity.
- Implement Non-Destructive Testing.
- Design for Fatigue Resistance.
- Understand Creep Behavior.
- Analyze Composite Materials.
- Utilize Computational Tools.
- Conduct Failure Analysis.

## Course Content:

### Unit 1: Introduction to Strength of Materials Engineering and Sciences:

- Stresses and forces
- Strains and deformations.
- Material failure mechanisms.
- The general theory of Elasticity and its applications.

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## Unit 2: Explaining 12 Key Scientific Experiments Related to Material Resistance:

- Hardness testing.
- Tensile strength assessment.
- Compression resistance.
- Impact resilience scrutinization.
- Buckling investigation.
- Bending endurance evaluation.
- Fatigue lifespan determination.
- Creep rate measurement.
- Burst Testing parameters.
- Torsion test procedures.
- Analysis of Thin-Walled Pressure Vessels.
- Metallographic Analysis Essentials.
- Non-Destructive Testing NDT techniques.

## Unit 3: Applying Scientific Experiments to Engineering Realities:

- Analysis of Compound Stresses.
- Deflection of beams and its implications.
- Resolve Special beam problems.
- Understand the behavior of Cylinders and curved bars.
- The study of Buckling in structures.
- Experimental Approaches to Elasticity.

## Unit 4: Implementing Knowledge in Inspection and Maintenance:

- Create effective Monitoring plans.
- Key considerations during Surveys of structure sections above water level.
- Strategies for Underwater surveys.
- Evaluate structure condition and performance.
- General Maintenance considerations for longevity.
- Approaches to Repair and rehabilitation of rock-armoured structures.
- Methods for Major Rehabilitation Strengthening.

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## Unit 5: Advanced Topics in Strength of Materials Engineering and Sciences

- Explore advanced theories of plasticity and their engineering applications.
- Understand the principles of fracture mechanics and failure analysis.
- Examine viscoelasticity and its implications in material design.
- Analyze the microstructural effects on material properties.
- Investigate advanced composites and their mechanical behaviors.
- Delve into the effects of temperature on material strength and performance.
- Study the principles of material fatigue and life prediction models.
- Evaluate advanced methods for material testing and characterization.
- Understand the role of computational mechanics in materials engineering.
- Examine case studies on material failure in engineering structures.
- Explore recent advancements in smart materials and their applications.
- Discuss the future trends and challenges in the strength of materials engineering.