

# FUNDAMENTALS OF MATERIALS SELECTIONS



## OUR ACCREDITATION & PARTNERS



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## OVERALL DESCRIPTION:

In today's competitive landscape, the choice of a material is more than a technical specification—it's a critical business imperative that directly impacts a project's lifecycle, from safety and reliability to profitability and sustainability. This course is designed to empower professionals to move beyond basic material recognition and develop a strategic, holistic approach to material selection. We will reframe material selection as a systematic, data-driven process that mitigates risk, optimizes performance, and provides a distinct competitive advantage. You will learn to make confident decisions that ensure the longevity and success of your designs and assets.

## Course Objectives:

**Upon completion of this course, participants will have the knowledge and skills to:**

- Analyze and interpret the fundamental properties of a wide range of engineering materials, including metals, polymers, ceramics, and composites.
- Evaluate and compare materials based on their mechanical, thermal, electrical, and chemical properties to meet specific application requirements.
- Apply a structured methodology for material selection, considering factors like manufacturing feasibility, cost-effectiveness, and environmental impact.
- Identify and mitigate potential failure mechanisms, such as corrosion, fatigue, and fracture, by selecting the most appropriate materials for harsh operating conditions.
- Utilize case studies and practical examples to make informed, strategic decisions in real-world scenarios across various industries.

## Course Outline:

### Introduction to Engineering Materials

- Classification and characteristics of metals, polymers, ceramics, and composites.
- Understanding the microstructure and its influence on material behavior.



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### Key Material Properties

- Mechanical properties: strength, stiffness, toughness, and hardness.
- Physical properties: density, thermal conductivity, and electrical resistance.
- Chemical properties: corrosion resistance and environmental degradation.

### Strategic Selection Methodology

- Systematic approach to defining design requirements and performance criteria.
- Decision-making tools and data resources for materials selection.
- Introduction to Ashby charts for visual material comparison.

### Material Failure and Prevention

- Mechanisms of corrosion, fatigue, and creep.
- Protective measures and surface treatments to enhance material life.

### Economic and Sustainable Considerations

- Analyzing total cost of ownership (TCO) including procurement, maintenance, and end-of-life costs.
- Exploring the impact of material choices on sustainability and circular economy principles.

## WHO SHOULD ATTEND?

This course is ideally suited for professionals involved in the design, engineering, and management of physical assets where material integrity is paramount. This includes Mechanical, Chemical, and Civil Engineers, Project Managers, Design Engineers, Technical Sales Professionals, and Quality Assurance Specialists. It is also highly beneficial for anyone seeking to enhance their strategic decision-making capabilities regarding product development and asset management.

## Course Methodology:

We utilize a variety of proven adult learning techniques to ensure maximum understanding, comprehension and retention of the information presented. This training course will be conducted as a highly interactive workshop session. A variety of training methodologies will be used Before and during the course whenever applicable. Some of these methods are gamification, online pre-post test, role plays, self-assessment instruments, group exercises & case studies.

