Advanced Materials Engineering in Manufacturing Training Course

Professional Development Training Course Outline

Category	Manufacturing	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Advanced Materials Engineering in Manufacturing is a cutting-edge training program designed to equip engineers, technologists, and industrial professionals with the latest knowledge in nanomaterials, smart materials, composite engineering, additive manufacturing, and sustainable production systems. As global industries shift toward Industry 5.0, smart factories, and high-performance lightweight materials, this course provides a deep understanding of how advanced materials are transforming automotive, aerospace, biomedical, electronics, and energy manufacturing sectors.

Advanced Materials Engineering in Manufacturing Training Course integrates theoretical foundations with real-world industrial applications, focusing on material innovation, process optimization, failure analysis, and sustainable manufacturing technologies. Participants will gain expertise in selecting and designing advanced materials for enhanced durability, efficiency, and performance. With strong emphasis on AI-driven materials discovery, 3D printing technologies, nanotechnology applications, and green manufacturing practices, this training prepares learners to meet the demands of modern high-tech production environments.

Programme Curriculum

Advanced Materials Engineering in Manufacturing Training Course

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Course Objectives

1. Understand fundamentals of advanced materials science and engineering
2. Analyze nanotechnology applications in modern manufacturing
3. Apply principles of composite material design and optimization
4. Evaluate smart materials and shape memory alloys
5. Integrate additive manufacturing (3D printing) techniques
6. Improve material selection for industrial performance enhancement
7. Explore sustainable and green manufacturing technologies
8. Study AI-driven materials discovery and simulation tools
9. Perform failure analysis and predictive maintenance in materials
10. Understand aerospace-grade and automotive lightweight materials
11. Develop skills in surface engineering and coating technologies
12. Implement Industry 5.0 smart factory material systems
13. Apply data-driven materials engineering for innovation

Target Audience

1. Manufacturing Engineers
2. Materials Scientists & Researchers
3. Mechanical & Industrial Engineers
4. Aerospace & Automotive Engineers
5. Production & Process Managers
6. Quality Assurance Professionals
7. R&D Specialists in Advanced Manufacturing
8. Final-year Engineering Students & Postgraduates

Course Modules

Module 1: Introduction to Advanced Materials Engineering

- Evolution of materials science
- Classification of engineering materials
- Industrial applications overview
- Material lifecycle understanding
- Emerging global trends
- **Case Study:** Boeing’s use of composite materials in aircraft design

Module 2: Nanotechnology in Manufacturing

- Nano-scale material behavior
- Nano-coatings and applications
- Carbon nanotubes & graphene
- Nano-fabrication techniques
- Industrial nanomaterial safety
- **Case Study:** Nanotech coatings in medical implants

Module 3: Composite Materials Engineering

- Fiber-reinforced composites
- Polymer matrix systems
- Hybrid composite structures
- Mechanical performance optimization
- Manufacturing techniques
- **Case Study:** Carbon fiber composites in Formula 1 cars

Module 4: Smart Materials & Shape Memory Alloys

- Thermo-responsive materials
- Piezoelectric materials
- Self-healing materials
- Actuation mechanisms
- Industrial applications
- **Case Study:** Shape memory alloys in aerospace actuators

Module 5: Additive Manufacturing (3D Printing)

- FDM, SLA, SLS technologies
- Metal 3D printing processes
- Design for additive manufacturing
- Material selection for AM
- Post-processing techniques
- **Case Study:** 3D printed jet engine components by GE Aviation

Module 6: Materials Characterization Techniques

- Microscopy methods (SEM, TEM)
- Spectroscopy techniques
- Mechanical testing methods
- Thermal analysis
- Microstructure evaluation
- **Case Study:** Failure analysis of turbine blades

Module 7: Surface Engineering & Coatings

- Thin film deposition
- Thermal spray coatings
- Corrosion resistance techniques
- Hard coatings applications
- Tribology fundamentals
- **Case Study:** Anti-corrosion coatings in marine structures

Module 8: Sustainable Materials & Green Manufacturing

- Eco-friendly materials
- Recycling in manufacturing
- Life cycle assessment (LCA)
- Carbon footprint reduction
- Circular economy models
- **Case Study:** Biodegradable packaging in FMCG industry

Module 9: AI & Machine Learning in Materials Engineering

- Predictive materials modeling
- Data-driven material discovery
- Simulation tools
- Smart material databases
- Optimization algorithms
- **Case Study:** AI-based alloy development in automotive sector

Module 10: Lightweight Materials for Automotive & Aerospace

- Aluminum alloys
- Magnesium alloys
- Titanium applications
- Weight reduction strategies
- Performance trade-offs
- **Case Study:** Tesla lightweight battery enclosure design

Module 11: Failure Analysis & Reliability Engineering

- Fracture mechanics
- Fatigue failure analysis
- Stress testing methods
- Root cause analysis
- Preventive engineering
- **Case Study:** Bridge structural failure investigation

Module 12: Industrial Material Processing Techniques

- Casting & molding innovations
- Powder metallurgy
- Heat treatment processes
- Welding technologies
- Machining of advanced materials
- **Case Study:** Aerospace-grade titanium machining process

Module 13: Biomaterials & Medical Applications

- Biocompatible materials
- Tissue engineering materials
- Implants & prosthetics
- Drug delivery systems
- Regulatory considerations

- **Case Study:** Titanium hip implants in orthopedic surgery

Module 14: Energy Materials & Storage Systems

- Battery materials engineering
- Fuel cell technologies
- Solar material advancements
- Supercapacitors
- Energy efficiency optimization
- **Case Study:** Lithium-ion battery innovation in EVs

Module 15: Future Trends in Materials Engineering

- Smart factory integration
- Quantum materials
- Self-healing structures
- Space-grade materials
- Next-gen manufacturing systems
- **Case Study:** NASA advanced heat-resistant materials for space missions

Training Methodology

This course employs a participatory and hands-on approach to ensure practical learning, including:

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

Ready to enroll or request a customized program? Book online or contact us:

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