Composite Materials Manufacturing Training Course

Professional Development Training Course Outline

Category	Manufacturing	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Composite materials are revolutionizing modern engineering and manufacturing due to their superior strength-to-weight ratio, corrosion resistance, and design flexibility. Industries such as aerospace, automotive, marine, wind energy, and defense increasingly rely on advanced composites like carbon fiber reinforced polymers (CFRP), glass fiber composites (GFRP), and hybrid laminates to achieve high-performance, lightweight, and durable structures. Composite Materials Manufacturing Training Course is designed to equip learners with in-depth technical knowledge and hands-on skills in composite fabrication, processing techniques, tooling, and quality assurance aligned with Industry 4.0 manufacturing standards.

With rapid advancements in smart manufacturing, automation, nanocomposites, and sustainable materials, professionals must understand modern composite production methods such as vacuum infusion, autoclave curing, filament winding, and resin transfer molding (RTM). This course bridges theoretical principles with industrial applications, enabling participants to develop expertise in defect control, material selection, process optimization, and performance evaluation of composite structures used in high-tech engineering environments.

Programme Curriculum

Composite Materials Manufacturing Training Course

Introduction

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Course Duration

5 days

Course Objectives

1. Understand fundamentals of advanced composite materials engineering
2. Analyze properties of carbon fiber, glass fiber, and hybrid composites
3. Master composite manufacturing processes (RTM, VARTM, autoclave curing)
4. Apply resin chemistry and polymer matrix behavior knowledge
5. Develop skills in laminate design and ply stacking sequences
6. Implement defect detection and non-destructive testing (NDT) techniques
7. Optimize lightweight structural design for aerospace and automotive applications
8. Gain expertise in tooling design and mold fabrication
9. Understand sustainability and recyclable composite technologies
10. Apply Industry 4.0 automation in composite production lines
11. Improve quality control and inspection methods for composites
12. Learn failure analysis and structural performance evaluation
13. Develop capability in real-world composite manufacturing project execution

Target Audience

1. Mechanical Engineers
2. Aerospace Engineers
3. Automotive Design Engineers
4. Manufacturing Technologists
5. Materials Science Students
6. Quality Assurance Professionals
7. Production Supervisors in Composite Industry
8. R&D Engineers in Advanced Materials Sector

Course Modules

Module 1: Fundamentals of Composite Materials

- Introduction to composite material systems
- Types: polymer, metal, ceramic matrix composites
- Fiber reinforcement mechanisms
- Matrix material selection principles
- Mechanical behavior and stress-strain response
- **Case Study:** Boeing 787 Dreamliner composite structure design analysis

Module 2: Reinforcement Fibers & Matrix Systems

- Carbon fiber vs glass fiber vs aramid fibers
- Thermoset vs thermoplastic resins
- Fiber architecture and alignment effects
- Prepreg material technology
- Adhesion and interface bonding
- **Case Study:** Carbon fiber application in Formula 1 racing cars

Module 3: Composite Manufacturing Processes

- Hand lay-up and spray-up techniques
- Vacuum infusion (VARTM) process
- Resin Transfer Molding (RTM)
- Autoclave curing systems
- Filament winding technology
- **Case Study:** Wind turbine blade manufacturing using RTM process

Module 4: Tooling & Mold Design

- Mold material selection and fabrication
- Tooling design considerations
- Thermal expansion and curing compatibility
- Surface finish and release systems
- Cost optimization in tooling design
- **Case Study:** Aerospace-grade composite mold manufacturing optimization

Module 5: Laminate Theory & Structural Design

- Classical laminate theory (CLT)
- Ply orientation and stacking sequences
- Strength-to-weight optimization
- Finite element analysis (FEA) integration
- Failure criteria (Tsai-Wu, Hashin models)
- **Case Study:** Aircraft wing composite laminate optimization

Module 6: Quality Control & NDT Techniques

- Visual inspection and defect identification
- Ultrasonic testing in composites
- Thermography and X-ray inspection
- Void content and porosity analysis
- Standards: ASTM and ISO compliance
- **Case Study:** Defect detection in aerospace composite fuselage panels

Module 7: Advanced Composite Applications

- Aerospace structural components
- Automotive lightweight body panels
- Marine hull structures
- Wind energy turbine blades
- Sports and defense applications
- **Case Study:** Tesla EV carbon composite structural innovation

Module 8: Smart Manufacturing & Sustainability

- Industry 4.0 in composite production
- Robotics and automation in lay-up processes
- Smart sensors for process monitoring
- Recycling and circular economy in composites
- Green composite materials development
- **Case Study:** Sustainable recycled carbon fiber in automotive industry

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	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

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

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