Composite Structures Engineering Training Course

Professional Development Training Course Outline

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

Course Introduction

Composite Structures Engineering is a rapidly evolving field at the intersection of advanced materials science, aerospace engineering, automotive innovation, and structural optimization. With the increasing global demand for lightweight, high-strength, corrosion-resistant, and fuel-efficient materials, composite structures have become a cornerstone in industries such as aerospace, marine, wind energy, automotive, civil infrastructure, and defense systems. Composite Structures Engineering Training Course is designed to provide a comprehensive understanding of fiber-reinforced polymers (FRP), carbon fiber composites, hybrid laminates, and advanced sandwich structures, equipping engineers with cutting-edge skills aligned with Industry 4.0 standards.

As industries transition toward sustainable engineering, digital twin simulation, finite element analysis (FEA), and AI-driven material design, mastering composite structures has become essential for modern engineers. This course integrates theoretical foundations with real-world applications, focusing on design optimization, failure analysis, manufacturing techniques, non-destructive testing (NDT), and lifecycle performance evaluation. Participants will gain hands-on expertise in solving complex engineering challenges while adhering to global standards such as ASTM, ISO, and aerospace-grade certification protocols, making them industry-ready for high-performance engineering roles.

Programme Curriculum

Composite Structures Engineering Training Course

Introduction

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Course Objectives

1. Master advanced composite materials engineering and design principles
2. Understand fiber-reinforced polymer (FRP) structural behavior and mechanics
3. Apply finite element analysis (FEA) for composite stress simulation
4. Develop skills in aerospace-grade composite manufacturing techniques
5. Evaluate failure modes in laminated composite structures
6. Implement non-destructive testing (NDT) and inspection methods
7. Design lightweight high-performance structural systems
8. Integrate sustainable and eco-friendly composite materials
9. Use digital twin technology for composite lifecycle analysis
10. Optimize multi-scale material modeling and simulation
11. Understand hybrid composite and sandwich panel engineering
12. Apply industry standards (ASTM, ISO, FAA compliance)
13. Enhance innovation in automotive and aerospace structural design

Target Audience

1. Aerospace Engineers
2. Mechanical Design Engineers
3. Civil & Structural Engineers
4. Automotive R&D Specialists
5. Materials Science Researchers
6. Manufacturing & Production Engineers
7. Graduate Engineering Students
8. Defense & Marine Engineering Professionals

Course Modules

Module 1: Introduction to Composite Materials Engineering

- Fundamentals of composites and material classification
- Fiber, matrix, and interface behavior

- Anisotropy and orthotropic material properties
- Advantages over conventional materials
- Applications across industries
- **Case Study:** Boeing 787 Dreamliner composite structure analysis

Module 2: Fiber Reinforced Polymer (FRP) Systems

- Types of fibers: carbon, glass, aramid
- Polymer matrix systems
- Reinforcement alignment techniques
- Mechanical performance evaluation
- Environmental durability
- **Case Study:** Wind turbine blade FRP optimization

Module 3: Mechanics of Composite Materials

- Stress-strain behavior in composites
- Lamina and laminate theory
- Failure criteria (Tsai-Wu, Hashin)
- Elastic constants determination
- Load transfer mechanisms
- **Case Study:** Automotive crash-resistant composite panels

Module 4: Laminate Design & Analysis

- Ply stacking sequence design
- Orientation angle optimization
- Symmetric vs unsymmetric laminates
- Thermal stress considerations
- Strength prediction models
- **Case Study:** Aerospace fuselage laminate design

Module 5: Finite Element Analysis (FEA) of Composites

- Meshing composite structures
- Material modeling techniques
- Boundary condition setup
- Stress distribution analysis
- Software simulation workflows
- **Case Study:** Helicopter rotor blade FEA simulation

Module 6: Composite Manufacturing Processes

- Hand lay-up and spray techniques
- Vacuum bagging and autoclave curing
- Resin transfer molding (RTM)
- Filament winding methods
- Additive manufacturing of composites
- **Case Study:** Formula 1 monocoque chassis production

Module 7: Sandwich Structures Engineering

- Core materials and face sheets
- Honeycomb and foam cores
- Bending stiffness optimization
- Impact resistance design
- Lightweight structural applications
- **Case Study:** Aircraft floor panel sandwich structure

Module 8: Failure Analysis in Composites

- Delamination and matrix cracking
- Fiber breakage mechanisms
- Fatigue and creep behavior
- Impact damage assessment
- Progressive failure modelling
- **Case Study:** Aircraft wing failure investigation

Module 9: Non-Destructive Testing (NDT)

- Ultrasonic testing methods
- X-ray and radiography inspection
- Thermography techniques
- Acoustic emission analysis
- Quality assurance protocols
- **Case Study:** Spacecraft composite inspection system

Module 10: Advanced Material Modeling

- Multiscale modeling approaches
- Micromechanics of composites
- Constitutive modeling
- Damage evolution laws
- Simulation calibration techniques
- **Case Study:** Carbon fiber composite predictive modeling

Module 11: Aerospace Composite Applications

- Aircraft structural components
- Spacecraft heat-resistant composites
- UAV lightweight structures
- Aerodynamic optimization
- Certification requirements
- **Case Study:** Airbus A350 composite integration

Module 12: Automotive Composite Engineering

- Lightweight vehicle structures
- Crash energy absorption systems
- Electric vehicle composite chassis
- Thermal management systems
- Cost-performance optimization
- **Case Study:** Tesla carbon fiber body components

Module 13: Marine Composite Structures

- Corrosion-resistant design
- Hull reinforcement systems
- Offshore platform applications
- Saltwater durability testing
- Hydrodynamic optimization
- **Case Study:** Yacht composite hull engineering

Module 14: Sustainable Composite Engineering

- Bio-based composite materials
- Recycling and reuse technologies
- Environmental impact assessment
- Green manufacturing techniques
- Circular economy integration
- **Case Study:** Recycled carbon fiber automotive panels

Module 15: Digital Twin & Smart Composites

- Real-time structural monitoring
- Sensor-integrated composites
- AI-based predictive maintenance
- Digital twin lifecycle modeling
- Smart material systems
- **Case Study:** Smart aerospace wing monitoring system

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

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