Advanced Simulation & Modeling 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

The Advanced Simulation & Modeling in Manufacturing Training Course is designed to equip professionals with cutting-edge capabilities in digital manufacturing, Industry 4.0 systems, and AI-powered production optimization. As global manufacturing shifts toward smart factories, cyber-physical systems, and data-driven decision-making, simulation and modeling have become critical tools for reducing cost, improving efficiency, and accelerating innovation. Advanced Simulation & Modeling in Manufacturing Training Course provides deep exposure to computational modeling, digital twin technology, predictive analytics, and virtual prototyping used across modern manufacturing environments.

Participants will gain hands-on expertise in leveraging CAE (Computer-Aided Engineering), discrete event simulation, finite element analysis (FEA), and process optimization tools to solve real-world manufacturing challenges. The program is structured to bridge the gap between theoretical modeling and industrial application, enabling learners to design, simulate, validate, and optimize manufacturing systems in a fully digital environment. By the end of the course, participants will be capable of implementing AI-driven simulation workflows, smart production systems, and real-time manufacturing analytics for next-generation industrial performance.

Programme Curriculum

Advanced Simulation & Modeling in Manufacturing Training Course

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Course Duration

10 days

Course Objectives

1. Master Digital Twin Technology for Smart Manufacturing Systems
2. Apply Advanced Computational Modeling in Industrial Processes
3. Develop expertise in AI-Driven Predictive Manufacturing Analytics
4. Optimize production using Discrete Event Simulation Techniques
5. Implement Finite Element Analysis (FEA) for Product Design Validation
6. Enhance efficiency through Lean Manufacturing Simulation Models
7. Design Cyber-Physical Production Systems for Industry 4.0
8. Use CAD/CAE integration for virtual prototyping
9. Improve decision-making with real-time manufacturing data simulation
10. Reduce operational cost using process optimization algorithms
11. Build expertise in supply chain simulation modeling
12. Apply Monte Carlo simulation in risk-based manufacturing decisions
13. Integrate IoT-enabled smart factory simulation environments

Target Audience

- Manufacturing Engineers & Production Managers
- Industrial Automation Specialists
- Mechanical & Design Engineers
- Data Scientists in Manufacturing Analytics
- Supply Chain & Operations Managers
- Quality Assurance & Process Improvement Professionals
- R&D and Product Development Engineers
- Industry 4.0 Transformation Consultants

Course Modules

Module 1: Foundations of Manufacturing Simulation

- Simulation principles & systems thinking
- Types of manufacturing simulation models
- Workflow of virtual manufacturing systems
- Introduction to digital factory concepts

- Software overview (AnyLogic, Arena, Simul8)
- **Case Study:** Automotive assembly line efficiency improvement using simulation modeling

Module 2: Digital Twin Technology

- Digital twin architecture in manufacturing
- Real-time synchronization with physical systems
- Sensor integration & IoT connectivity
- Lifecycle management of digital twins
- Predictive maintenance modeling
- **Case Study:** Aerospace engine digital twin for failure prediction

Module 3: Finite Element Analysis (FEA)

- Stress-strain simulation fundamentals
- Material behavior modeling
- Structural optimization techniques
- Thermal and fatigue analysis
- FEA software application (ANSYS, Abaqus)
- **Case Study:** Crash simulation of automotive chassis design

Module 4: Discrete Event Simulation (DES)

- Event-driven system modeling
- Queueing theory in production systems
- Bottleneck analysis techniques
- Workflow optimization strategies
- Simulation of manufacturing lines
- **Case Study:** Bottleneck elimination in electronics manufacturing plant

Module 5: Computational Fluid Dynamics (CFD)

- Fluid flow modeling in manufacturing
- Heat transfer simulation
- Aerodynamic optimization
- Multiphase flow systems
- CFD tool applications
- **Case Study:** Cooling system optimization in injection molding

Module 6: AI in Manufacturing Simulation

- Machine learning integration in simulation
- Predictive modeling techniques
- Neural networks for process optimization
- Data-driven decision systems
- Intelligent manufacturing systems
- **Case Study:** AI-based defect prediction in semiconductor manufacturing

Module 7: Smart Factory Design

- Industry 4.0 architecture
- Cyber-physical systems integration

- IoT-enabled production lines
- Real-time monitoring systems
- Automation frameworks
- **Case Study:** Smart factory implementation in consumer electronics

Module 8: Supply Chain Simulation

- End-to-end logistics modeling
- Demand forecasting simulation
- Inventory optimization systems
- Risk and disruption modeling
- Global supply chain networks
- **Case Study:** Retail supply chain resilience optimization

Module 9: Virtual Prototyping

- Digital product design cycles
- Simulation-based prototyping
- Rapid iteration techniques
- Cost reduction strategies
- Validation and testing workflows
- **Case Study:** Virtual prototyping of medical device design

Module 10: Process Optimization Techniques

- Lean simulation methods
- Six Sigma integration
- Optimization algorithms
- Productivity enhancement models
- Resource allocation strategies
- **Case Study:** Production efficiency improvement in FMCG plant

Module 11: Monte Carlo Simulation

- Probabilistic modeling concepts
- Risk analysis frameworks
- Statistical simulation methods
- Decision support systems
- Scenario analysis tools
- **Case Study:** Risk modeling in automotive supply chain disruptions

Module 12: Robotics & Automation Simulation

- Robotic workflow simulation
- Human-robot collaboration models
- Automated assembly systems
- Motion path optimization
- Industrial robotics programming
- **Case Study:** Robotic arm optimization in packaging industry

Module 13: Energy & Sustainability Modeling

- Energy consumption simulation
- Carbon footprint analysis
- Sustainable manufacturing design
- Green factory systems
- Resource efficiency models
- **Case Study:** Energy optimization in steel manufacturing plant

Module 14: Manufacturing Data Analytics

- Big data in manufacturing systems
- Real-time dashboards
- KPI-based simulation analysis
- Predictive maintenance analytics
- Data visualization tools
- **Case Study:** Predictive maintenance in CNC machining operations

Module 15: Integrated Manufacturing Systems

- End-to-end system integration
- Cross-platform simulation modeling
- Enterprise manufacturing systems
- Digital ecosystem alignment
- Future-ready manufacturing frameworks
- **Case Study:** Full-scale digital transformation of a smart industrial plant

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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Email: info@fineskilltrainingcenter.com | Website: www.fineskilltrainingcenter.com