AI-Driven Quality Control 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

Artificial Intelligence (AI) is revolutionizing modern manufacturing by enabling real-time quality inspection, predictive defect detection, automated visual inspection, and smart process optimization. The integration of Machine Learning (ML), Computer Vision, Deep Learning, Industrial IoT (IIoT), and Edge AI has transformed traditional quality control systems into intelligent, self-learning ecosystems. AI-Driven Quality Control in Manufacturing Training Course is designed to equip professionals with advanced skills to implement automated defect detection, predictive maintenance, anomaly detection, and zero-defect manufacturing strategies using cutting-edge AI technologies.

As global manufacturing shifts toward Industry 4.0, smart factories, and data-driven production systems, organizations are increasingly adopting AI-powered quality assurance frameworks to reduce waste, improve efficiency, and enhance product consistency. This course provides hands-on knowledge of AI model training, computer vision inspection systems, digital twins, sensor fusion, and predictive analytics, empowering learners to build scalable AI solutions for next-generation manufacturing environments. Participants will gain practical exposure to tools and frameworks that drive smart quality assurance, automated inspection pipelines, and AI-enabled production intelligence systems.

Programme Curriculum

AI-Driven Quality Control in Manufacturing Training Course

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Course Duration

10 days

Course Objectives

1. Understand AI-powered quality control systems in smart manufacturing environments
2. Apply Machine Learning algorithms for defect detection and classification
3. Implement Computer Vision for automated visual inspection systems
4. Develop predictive quality analytics using Industrial IoT data streams
5. Build deep learning models for surface defect recognition and anomaly detection
6. Integrate Edge AI solutions for real-time manufacturing inspection
7. Optimize production using AI-driven process optimization techniques
8. Deploy digital twin technology for manufacturing quality simulation
9. Utilize sensor fusion for enhanced defect prediction accuracy
10. Implement automated quality assurance pipelines in Industry 4.0 factories
11. Analyze manufacturing data using big data analytics and AI dashboards
12. Reduce production waste through zero-defect manufacturing strategies
13. Design scalable AI-enabled smart factory quality control systems

Target Audience

1. Manufacturing Engineers & Production Managers
2. Quality Assurance & Quality Control Professionals
3. Data Scientists in Industrial AI Applications
4. Automation & Robotics Engineers
5. Industrial IoT Solution Architects
6. AI/ML Developers in Manufacturing Sector
7. Operations & Supply Chain Managers
8. Engineering Students & Technical Researchers

Course Modules

Module 1: Introduction to AI in Manufacturing QC

- Evolution of quality control systems
- Role of AI in smart factories
- Industry 4.0 transformation
- AI vs traditional inspection systems

- Data-driven manufacturing overview
- **Case Study:** Automotive plant reducing defect rates using AI inspection systems

Module 2: Fundamentals of Machine Learning

- Supervised vs unsupervised learning
- Classification and regression models
- Training datasets for manufacturing
- Feature engineering basics
- Model evaluation metrics
- **Case Study:** Predicting product failure in electronics assembly line

Module 3: Computer Vision in Quality Inspection

- Image processing fundamentals
- Object detection techniques
- Real-time visual inspection systems
- Camera calibration methods
- Defect segmentation models
- **Case Study:** Surface defect detection in steel manufacturing

Module 4: Deep Learning for Defect Detection

- CNN architectures
- Transfer learning models
- Training deep learning datasets
- Model optimization techniques
- Accuracy improvement strategies
- **Case Study:** Fabric defect classification in textile industry

Module 5: Industrial IoT for Data Collection

- Sensor networks in manufacturing
- Real-time data acquisition
- IIoT architecture
- Data streaming pipelines
- Edge device integration
- **Case Study:** Smart sensor deployment in food processing plant

Module 6: Predictive Quality Analytics

- Predictive modeling techniques
- Failure prediction systems
- Trend analysis methods
- Statistical quality control
- Time-series forecasting
- **Case Study:** Predicting equipment failure in CNC machines

Module 7: Edge AI for Real-Time Inspection

- Edge computing fundamentals
- On-device AI processing

- Low-latency inference systems
- Embedded AI models
- Hardware optimization
- **Case Study:** Real-time defect detection in packaging line

Module 8: Digital Twins in Manufacturing

- Digital twin concepts
- Simulation-based quality testing
- Virtual factory models
- Real-time synchronization
- Performance optimization
- **Case Study:** Aerospace component manufacturing simulation

Module 9: Anomaly Detection Systems

- Outlier detection methods
- Unsupervised learning models
- Fault detection algorithms
- Real-time monitoring systems
- Alert generation systems
- **Case Study:** Detecting anomalies in semiconductor production

Module 10: AI-Based Process Optimization

- Process parameter tuning
- Reinforcement learning applications
- Efficiency improvement models
- Bottleneck analysis
- Production optimization
- **Case Study:** Optimizing automotive assembly line speed

Module 11: Big Data Analytics in Manufacturing

- Data lakes and warehouses
- Manufacturing data pipelines
- KPI dashboards
- Data visualization tools
- Real-time analytics systems
- **Case Study:** Smart dashboard for factory-wide quality monitoring

Module 12: Robotics and Automation Integration

- AI in robotic inspection
- Automated sorting systems
- Robotic vision systems
- Smart conveyor systems
- Human-robot collaboration
- **Case Study:** Robotic quality inspection in electronics manufacturing

Module 13: Zero-Defect Manufacturing Strategy

- Six Sigma + AI integration
- Defect prevention models
- Quality improvement frameworks
- Continuous improvement systems
- AI-driven compliance
- **Case Study:** Zero-defect initiative in pharmaceutical manufacturing

Module 14: AI Model Deployment in Production

- Model deployment pipelines
- Cloud vs edge deployment
- API integration systems
- Scalability techniques
- MLOps for manufacturing
- **Case Study:** Deploying AI inspection system in global factory network

Module 15: Future of AI in Smart Manufacturing

- Generative AI in QC systems
- Autonomous manufacturing plants
- AI-powered sustainability
- Next-gen smart factories
- Emerging Industry 5.0 trends
- **Case Study:** Fully autonomous smart factory prototype

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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