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COURSE BROCHURE

AI for Quality Control and Manufacturing Analytics Training Course

20 – 24 June 2027
Muscat

AI for Quality Control and Manufacturing Analytics Training Course

Ref: 21_554 **Date:** 20 – 24 June 2027 **Location:** Muscat **Fees:** 6500 GBP

AI for Quality Control and Manufacturing Analytics is a 1-week training course for quality managers, production engineers and manufacturing analysts, who leave with an AI quality monitoring plan for one production line. Cameras, sensors and machine learning now detect defects and drift faster than manual sampling, before scrap and recalls build up. Jupiter Prime Training runs this course on AI for quality control and manufacturing analytics for those who own product conformity.

Why AI for Quality Control and Manufacturing Analytics Matters Now

Three forces shape AI for quality control and manufacturing analytics today: affordable machine vision on the line, sensor and historian data from connected equipment, and customers who demand traceable, defect-free batches. Plants that use these well find defects at source, cut scrap and rework and release product with confidence; plants that deploy models without process knowledge drown in false rejects or miss rare defects that reach customers. Examples come from automotive component machining and pharmaceutical packaging. The course treats model risk with ISO/IEC 42001 for AI management systems and the NIST AI Risk Management Framework AI RMF.

Who Gains Most from AI for Quality Control and Manufacturing Analytics

- Quality managers accountable for conformity, inspection plans and customer complaints
- Production engineers responsible for process capability and line yield
- Manufacturing analysts who build reports and models from shop-floor data
- Process and reliability engineers who investigate recurring defects
- Plant digitalisation leads who select vision and analytics systems

The biggest gain comes when a quality manager, a production engineer and an analyst responsible for the same line attend together.

AI for Quality Control and Manufacturing Analytics Capabilities

Participants learn to turn images, sensor signals and inspection records into early warnings.

- Specify a computer vision inspection station with image capture, labelling and reject logic — line quality owners
- Apply machine learning to statistical process control to detect multivariate drift — production engineers
- Build defect prediction models from process parameters and batch records — plant managers
- Test root-cause hypotheses with feature importance and correlation analytics — problem-solving teams
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Calculate false accept and false reject costs to set model thresholds — quality and finance leads
- Design an AI quality monitoring plan with alerts, owners and escalation — the plant leadership team

Key AI for Quality Control and Manufacturing Analytics Terms

- Computer Vision Inspection — automatic checking of parts or packs from camera images using trained models.
- Statistical Process Control — monitoring a process with control charts to separate normal variation from special causes.
- Multivariate Drift — a gradual shift in several related process variables that single-variable charts may miss.
- Defect Prediction — estimating the likelihood that a unit or batch will fail inspection from upstream process data.
- False Reject Rate — the share of good units wrongly rejected by an inspection system.
- Root-Cause Analytics — data methods that rank the process factors most associated with a defect.

AI for Quality Control and Manufacturing Analytics Day by Day

Day 1: Quality Data and the Smart Factory

- Cost of Poor Quality Mapping — Scrap, Rework and Escape Exposure
- Shop-Floor Data Sources — Sensors, Historians, MES and Inspection Records
- Data Quality and Traceability Checks — Linking Units to Process Conditions
- AI Use Case Map for Quality — Inspection, Monitoring and Prediction
- Line Selection Matrix — Where Analytics Pays Back Soonest

Day 2: Computer Vision Inspection

- Camera, Lighting and Image Capture Design — Detectability of Defect Types
- Image Labelling and Defect Libraries — Consistent Ground Truth
- Classification and Anomaly Detection Models — Known Versus Unseen Defects
- Reject Logic and Threshold Setting — Balancing False Accepts and Rejects
- Vision System Validation — Measurement System Analysis for Models

Day 3: Machine Learning for Process Control

- Control Chart Refresher — Shewhart, CUSUM and EWMA Choices
- Multivariate Monitoring With Principal Component Methods — Correlated Variables
- Anomaly Detection on Sensor Streams — Early Drift Warnings
- Process Capability With Model Inputs — Cpk Trends and Limits
- Alert Fatigue Control — Prioritising Signals for Operators

Day 4: Defect Prediction and Root-Cause Analytics

- Defect Prediction Models From Batch Records — Hold or Release Decisions
- Feature Importance and Explainable Models — Credible Root-Cause Evidence
- Design of Experiments Combined With Analytics — Confirming Causes
- Model Drift and Retraining Triggers — Changing Materials and Equipment
- ISO/IEC 42001 and NIST AI RMF Controls — Quality Model Risk

Day 5: Practising the AI Quality Monitoring Plan

- Inspection Point Design for a Chosen Line — Applying Vision Methods
- Monitoring Variables and Alert Rules — Applying Multivariate Control
- Prediction and Root-Cause Routine — Applying Batch Analytics
- Threshold Cost Case — False Reject and Escape Trade-Offs
- AI Quality Monitoring Plan — Presentation to Plant Leadership

Applying AI for Quality Control and Manufacturing Analytics After the Course

- Build a multivariate control view for one critical step and compare its alerts with existing charts
- Assemble a labelled image library for the three most frequent visual defects on one line

AI for Quality Control and Manufacturing Analytics Questions FAQ

What is AI for quality control and manufacturing analytics and why does it matter now?

AI for quality control and manufacturing analytics applies machine vision, machine learning and process data to detect, predict and explain defects. It matters now because connected lines already generate the images and signals needed to move from end-of-line checks to in-process control.

Which roles gain most from AI for quality control and manufacturing analytics training?

Quality managers, production engineers, analysts and digitalisation leads gain most. They own inspection, capability and yield, and decide which thresholds protect customers without wasting good product.

How does AI for quality control and manufacturing analytics training differ from a classic quality tools course?

It adds vision models, multivariate monitoring and defect prediction to familiar control charts and problem-solving tools. You learn to judge model thresholds, drift and false rejects alongside traditional capability and sampling measures.

What do you bring back from AI for quality control and manufacturing analytics training?

You bring back an AI quality monitoring plan for one production line. It sets inspection points, monitored variables, alert rules, prediction routines, threshold costs and the owners who respond to each signal.

AI for Quality Control and Manufacturing Analytics: The Way Forward

The AI quality monitoring plan first informs where the chosen line gains a vision station or multivariate alert and which thresholds apply. Quality managers, production engineers and analysts use it to assign responses and track scrap and escapes. After the first month of alerts, revisit the false reject balance, since real production variation rarely matches training data.