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COURSE BROCHURE

# AI Fault Diagnosis for Rotating Machinery Training Course

14 – 18 February 2027
Doha

# AI Fault Diagnosis for Rotating Machinery Training Course

**Ref:** 51_1302 **Date:** 14 – 18 February 2027 **Location:** Doha **Fees:** 6500 GBP

AI Fault Diagnosis for Rotating Machinery is a 1-week training course for machine shop supervisors, rotating equipment engineers and condition monitoring technicians, who leave with a fault detection model specification and alert threshold plan. Low-cost accelerometers and thermal cameras now stream more spectra than analysts can read, so teams that teach models to recognise bearing, motor and gearbox defects catch them while repairs are simple. The course is delivered by Jupiter Prime Training.

## Why AI Fault Diagnosis for Rotating Machinery Matters Now

Three forces shape AI fault diagnosis for rotating machinery today: wireless vibration and temperature nodes cheap enough for pumps and fans never monitored before, compact edge processors that can run classifiers beside the machine, and fewer certified vibration analysts available to interpret spectra by hand. A shop that applies these methods well tells an outer-race defect from misalignment early. A shop that applies them badly trains on noisy data and drowns technicians in false trips. The course draws on vibration analysis practice, envelope demodulation and motor current signature analysis MCSA.

## Who Gains Most from AI Fault Diagnosis for Rotating Machinery

- Rotating equipment engineers responsible for pumps, compressors, fans and turbines
- Condition monitoring technicians who collect vibration, thermography and ultrasound readings
- Machine shop supervisors who schedule bearing changes, alignments and balancing
- Electrical maintenance specialists who diagnose motor winding and rotor bar faults
- Instrumentation technicians who install and maintain on-machine sensing nodes

A rotating equipment section gains most when its engineer, vibration technician and instrumentation technician attend together.

## AI Fault Diagnosis for Rotating Machinery Capabilities

Participants read machine signals the way a classifier must, then specify models technicians trust.

- Apply FFT and envelope spectra to separate bearing, gear and unbalance signatures — vibration route decisions
- Calculate bearing defect frequencies and gear mesh frequencies for labelled training sets — model developers
- Build feature sets from vibration, temperature and acoustic signals — classifier accuracy
- Weigh classical classifiers against neural networks on spectrogram images — engineering leads
- Specify edge hardware, sampling rates and on-device inference limits — instrumentation teams

- Design alert thresholds and severity bands for each fault class — machine shop supervisors

## Key AI Fault Diagnosis for Rotating Machinery Terms

- Fast Fourier Transform FFT — converting a vibration time signal into a frequency spectrum so fault peaks become visible.
- Envelope analysis — demodulating high-frequency vibration to expose repetitive impacts from early bearing defects.
- Bearing defect frequency — a calculated frequency, such as BPFO or BPFI, at which a damaged bearing element produces impacts.
- Motor current signature analysis MCSA — detecting rotor and winding faults from patterns in a motor's supply current.
- Spectrogram — an image showing how signal frequencies change over time.
- Edge inference — running a trained model on a device beside the machine instead of in a central server.

## AI Fault Diagnosis for Rotating Machinery Day by Day

## Day 1: Machine Faults and Their Signatures

- Failure Modes of Bearings, Gears, Shafts and Couplings — Diagnostic Priorities
- Unbalance, Misalignment and Looseness Patterns — Telling Common Faults Apart
- Motor Electrical Faults — Rotor Bars, Eccentricity and Winding Defects
- Machine Criticality and Monitoring Coverage — Which Trains Justify Models
- Labelled Fault History — Building Ground Truth from Teardown Findings

## Day 2: Signal Acquisition and Processing

- Accelerometer Mounting and Sampling Rates — Capturing Usable Spectra
- FFT, Envelope and Order Analysis — Revealing Speed-Linked Fault Peaks
- Infrared Thermography Patterns — Hot Bearings, Couplings and Connections
- Airborne and Contact Ultrasound — Lubrication and Early Friction Signs
- Motor Current Signature Analysis — Electrical Faults Without Stopping Machines

## Day 3: Features and Fault Classification Models

- Time and Frequency Domain Features — RMS, Kurtosis and Band Energies
- Bearing and Gear Mesh Frequency Features — Physics-Informed Inputs
- Random Forest and Gradient Boosting Classifiers — Interpretable Fault Labels
- Convolutional Networks on Spectrograms — Learning Patterns from Images
- Confusion Matrix Review — Where the Classifier Mistakes One Fault for Another

## Day 4: Edge Deployment and Alerting

- Edge Device Selection — Processing Power, Enclosure Rating and Power Supply
- Model Compression for On-Machine Inference — Size Versus Accuracy
- Alert Severity Bands — Linking Fault Class and Amplitude to Action
- False Trip Reduction — Persistence Rules and Operating State Filters
- Model Drift After Repairs — Retraining When Machines Change

## Day 5: Practising the Fault Detection Model Specification

- Target Machine Train Selection — Applying Criticality and Fault History
- Sensor and Sampling Plan — Applying Acquisition Choices from Day Two
- Feature and Classifier Choice — Applying Day Three Comparisons
- Technician Verification Routine — Confirming Alerts with Handheld Readings
- Fault Detection Model Specification and Alert Threshold Plan — Final Document

## Applying AI Fault Diagnosis for Rotating Machinery After the Course

- Calculate bearing defect frequencies for one critical pump train and label past vibration readings against teardown records.
- Trial persistence rules on an existing vibration alarm to cut false trips.

## AI Fault Diagnosis for Rotating Machinery Questions FAQ

### What is AI fault diagnosis for rotating machinery and why does it matter now?

AI fault diagnosis for rotating machinery uses classifiers on vibration, thermal, acoustic and current signals to name bearing, gear and motor defects. It matters now because sensors and edge processors are affordable while experienced vibration analysts are scarce in water, petrochemical and food plants.

### Which roles gain most from AI fault diagnosis for rotating machinery training?

Rotating equipment engineers, condition monitoring technicians, machine shop supervisors, electrical maintenance specialists and instrumentation technicians gain most. You benefit if you read spectra or install sensors.

### How does AI fault diagnosis for rotating machinery differ from a plant-wide predictive maintenance strategy course?

AI fault diagnosis for rotating machinery works at machine level: signals, features, classifiers and edge devices. A plant-wide predictive maintenance strategy course concentrates on asset selection, rollout and work management across many equipment types.

### What do you bring back from AI fault diagnosis for rotating machinery training?

You bring back a specification covering sensors, sampling, features, classifier choice and edge hardware. It includes severity bands, persistence rules and a technician verification routine.

## AI Fault Diagnosis for Rotating Machinery: The Way Forward

The fault detection model specification and alert threshold plan first informs which machine train is instrumented. Rotating equipment engineers and technicians use it to agree sensors and severity bands. After the first confirmed repairs, revisit the labels and thresholds, since each teardown adds ground truth that sharpens the classifier over time.