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COURSE BROCHURE

# Advanced Process Automation Training Course

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Registered in the United Kingdom and Saudi Arabia

# Advanced Process Automation Training Course

Advanced Process Automation is a 2-week training course for instrument and control engineers, automation leads and process engineers, ending with a control layer upgrade roadmap for one process unit. Plants now run with leaner operating crews, tighter energy margins and connected control networks, so the quality of loops, alarms and safety functions decides throughput and risk. Jupiter Prime Training delivers this course for process automation specialists.

## Why Process Automation Matters Now

Three forces are reshaping plant automation. Operating crews are smaller and less experienced, so the control system must hold units on target with fewer manual interventions and clearer alarms. Energy and feed costs reward units that run closer to constraints, which is the territory of advanced regulatory control and model predictive control. Control networks are also connected to business systems, which exposes them to cyber threats. The course rests on IEC 61511 for safety instrumented systems, ISA-18.2 for alarm management, IEC 62443 for industrial automation cybersecurity and ISA-88 for batch control. Plants that apply them coherently gain stable, defensible operation; those that do not accumulate oscillating loops and alarm floods.

## Who Gains Most from Process Automation

- Engineers who configure and maintain distributed control system strategies and loop tuning
- Automation leads accountable for control system lifecycle, upgrades and vendor interfaces
- Process engineers who set unit constraints, targets and operating envelopes for control
- Safety instrumented system engineers responsible for trip functions and proof testing
- Specialists who own control network segmentation, patching and remote access

A process unit gains most when its control engineer, process engineer and safety system engineer attend together and agree one view of loops, constraints and protective layers.

## Process Automation Capabilities

Participants leave able to judge which layer of the control hierarchy should solve each operating problem, from a single valve to a multivariable controller.

- Design cascade, ratio and feedforward schemes for disturbance-prone loops — unit stability and operator workload
- Calculate tuning parameters from step test data — loop performance acceptance with operations
- Assess whether a unit justifies model predictive control — capital requests for advanced control
- Specify safety instrumented functions within a layered protection scheme — trip design sign-off with process safety
- Apply alarm rationalisation to a flood-prone console — control room staffing and response decisions
- Weigh network zones and conduits for a control system — cybersecurity investment with information technology leaders

## Key Process Automation Terms

- Distributed control system — a plant-wide control platform with controllers, input and output modules, operator consoles and engineering stations linked by a control network.
- Cascade control — a scheme in which an outer loop sets the setpoint of a faster inner loop to reject disturbances early.
- Model predictive control — a multivariable controller that uses a process model to move several handles while respecting constraints.
- Safety instrumented function — an automatic protective function with sensors, logic and final elements that brings a process to a safe state.
- Alarm rationalisation — the systematic review of each alarm's cause, consequence, priority and operator response against an alarm philosophy.
- Zones and conduits — the cybersecurity model that groups assets by security need and controls communication between groups.

## Process Automation Day by Day

## Day 1: Automation Landscape and Control Hierarchy

- Purdue Reference Model Levels — Placement of Control and Business Functions
- Control Hierarchy from Field Devices to Optimisation — Layer Responsibilities
- Operating Crew Changes and Automation Demand — Staffing Implications
- Process Automation Standards Map — Lifecycle Obligations by Discipline
- Automation Performance Benchmarks — Unit Health Baseline Selection

## Day 2: Distributed Control System Architecture

- Controller, Input and Output Redundancy — Availability Design Choices
- Control Network Topology and Determinism — Communication Loading Limits
- Function Block Configuration Practice — Reusable Control Module Libraries
- Operator Graphics and Situational Awareness — High Performance Display Design
- Control System Migration Paths — Hot Cutover Versus Shutdown Replacement

## Day 3: Loop Dynamics and Controller Tuning

- Process Reaction Curves and Dead Time — Model Identification from Step Tests
- Proportional, Integral and Derivative Action — Tuning Method Selection
- Lambda Tuning for Interacting Loops — Robustness Versus Speed
- Valve Stiction and Hysteresis Diagnosis — Final Element Repair Decisions
- Loop Performance Monitoring Indices — Prioritising Retuning Effort

## Day 4: Advanced Regulatory Control Schemes

- Cascade Control for Temperature and Flow — Disturbance Rejection Gains
- Feedforward and Ratio Control — Feed Change Compensation
- Override and Selector Control — Constraint Protection Logic
- Split-Range and Valve Position Control — Utility and Energy Savings
- Dead Time Compensation with Smith Predictor — Long Delay Processes

## Day 5: Model Predictive Control

- Multivariable Process Models and Gain Matrices — Controller Scope Definition
- Constraint Handling and Economic Objectives — Operating Point Selection
- Plant Step Testing Campaigns — Model Quality and Downtime Trade-Offs
- Inferential Property Estimators — Quality Control Without Analysers
- Controller Benefits Tracking — Sustaining Uptime and Operator Trust

## Day 6: Batch and Sequential Automation

- ISA-88 Physical and Procedural Models — Recipe Structure Design
- Phase Logic and State Machines — Reusable Equipment Operations
- Recipe Management and Campaign Changeovers — Product Flexibility
- Interlocks and Permissives in Sequences — Operator Override Policy
- Batch Records and Electronic Reports — Quality Release Evidence

## Day 7: Safety Instrumented Systems

- IEC 61511 Safety Lifecycle Phases — Responsibilities from Analysis to Operation
- Layer of Protection Analysis Inputs — Required Risk Reduction Targets
- Safety Integrity Level Verification — Architecture and Proof Test Intervals
- Separation of Control and Safety Functions — Independence Arguments
- Bypass and Override Management — Operating with Degraded Protection

## Day 8: Alarm Management and Operator Response

- ISA-18.2 Alarm Lifecycle and Philosophy Document — Site Alarm Rules
- Alarm Rationalisation Sessions — Priority, Setpoint and Response Records
- Flood, Chattering and Stale Alarm Reduction — Console Performance Targets
- Shelving and State-Based Alarming — Startup and Shutdown Modes
- Alarm Key Performance Indicators — Monthly Review with Operations

## Day 9: Industrial Network Security

- IEC 62443 Zones, Conduits and Security Levels — Segmentation Design
- Control System Asset Inventory and Vulnerability Review — Patching Priorities
- Remote Access and Vendor Connections — Approval and Monitoring Rules
- Backup, Recovery and Incident Response for Controllers — Restoration Time
- Security Monitoring in Control Networks — Anomaly Detection Choices

## Day 10: Practising the Control Layer Upgrade Roadmap

- Loop Health Audit of a Chosen Unit — Retuning and Valve Repair List
- Advanced Control Opportunity Screening — Regulatory Scheme or Multivariable Controller
- Alarm and Safety Function Gap Review — Rationalisation and Verification Actions
- Network Segmentation and Access Plan — Security Level Targets
- Control Layer Upgrade Roadmap — Loop, Alarm, Safety and Security Actions

## Applying Process Automation After the Course

- Run a loop health audit on one unit, ranking loops by variability and valve condition, and agree a retuning and repair list with the operations superintendent.
- Lead an alarm rationalisation session for the busiest console, recording priority, setpoint and operator response for each alarm against the site philosophy.

## Process Automation Questions FAQ

### What is advanced process automation, and why does it matter now?

Advanced process automation covers the control system layers above basic loops, from cascade schemes and model predictive control to safety functions, alarms and network security. It matters now because leaner crews and connected networks make control quality decide throughput and risk.

### Which roles gain most from advanced process automation training?

Instrument and control engineers, automation leads and process engineers gain most. They configure control strategies, own the system lifecycle and set the constraints that controllers and safety functions must respect.

### How does advanced process automation differ from a basic instrumentation course?

It assumes participants already know transmitters, valves and single loops. It works on multivariable control, batch sequencing, safety lifecycle verification, alarm rationalisation and control network segmentation rather than device selection and calibration.

## What do you bring back from advanced process automation training?

You bring back a roadmap for one unit you know. It lists retuning and valve repairs, advanced control opportunities, alarm and safety function actions and network segmentation targets.

## Process Automation: The Way Forward

The control layer upgrade roadmap first informs which loops and alarms are corrected before any advanced controller is funded. Control engineers, process engineers and safety system engineers use it to sequence work with operations and maintenance. After the first round of fixes, revisit the loop performance indices behind it, because measured variability will show whether multivariable control is still the next step.