Process Control and Final Control Elements

Course general description:

This intensive five-day course provides in-depth knowledge of process control systems and final control elements essential for modern industrial operations. The course covers fundamental principles, advanced control strategies, instrumentation, and troubleshooting techniques. Participants will gain practical experience through hands-on exercises, simulations, and real-world case studies, enabling them to optimize process control systems and maintain efficient operations across various industrial applications.

Audience:

This course is designed for:

1. Process Control Engineers
2. Instrumentation Engineers
3. Process Operations Engineers
4. Maintenance Engineers
5. Plant Operators & Technicians
6. System Integrators

Course objectives:

1. Master process control fundamentals and advanced concepts
2. Understand final control element selection, operation, and maintenance
3. Implement effective control strategies and tuning methods
4. Analyze control loops and diagnose problems
5. Apply digital technologies in process control
6. Conduct troubleshooting of control systems
7. Optimize control system performance

Course duration:

5 days

Course location:

Cairo-Dubai-Istanbul

Course contents:

Day 1: Process Control Fundamentals

- Introduction & Pre-Test – Overview of process control, loop components, and key process variables.
- Control Modes & Loop Dynamics – PID control fundamentals, process response, dead time, and lag.
- Hands-on Learning – Basic control calculations and process loop analysis.
- Case Study & Discussion – Control challenges and practical loop tuning examples.
- Assessment & Review – Quiz on fundamental concepts.

Day 2: Final Control Elements

- Control Valves & Actuators – Types, selection criteria, and operating characteristics.
- Drive Systems & Performance – Variable speed drives, valve sizing, and installation best practices.
- Maintenance & Monitoring – Ensuring reliability and minimizing failure risks.
- Hands-on Learning – Valve sizing exercises and troubleshooting common issues.
- Case Study & Discussion – Real-world valve selection challenges and performance analysis.

Day 3: Advanced Control Strategies

- Specialized Control Techniques – Cascade, feedforward, ratio, and override control.
- Advanced Control Systems – Multi-variable, model predictive, adaptive, and batch control.

- Implementation Challenges – Optimizing control strategies for industrial applications.
- Hands-on Learning – Control strategy selection and optimization exercises.
- Assessment & Review – Quiz on advanced control techniques and case study discussion.

Day 4: Digital Technologies and Integration

- Digital Control Fundamentals – Smart instrumentation, fieldbus, and digital control networks.
- Industrial IoT & Analytics – Integrating control systems with IoT, data analytics, and asset management.
- Cybersecurity & System Reliability – Protecting industrial networks and ensuring system security.
- Hands-on Learning – Configuring digital control systems and network integration exercises.
- Case Study & Discussion – Smart technology applications and digital transformation strategies.

Day 5: Troubleshooting and Optimization

- Diagnostic Techniques – Identifying and resolving common control issues.
- Performance & Optimization – Loop tuning, system performance assessment, and efficiency improvements.
- Troubleshooting & Maintenance – Planning maintenance strategies for reliable operations.
- Hands-on Learning – Troubleshooting scenarios and real-world problem analysis.
- Final Review & Certification – Course recap, final assessment, and certification ceremony.

Methodology:

- 50% lectures & concepts
- 10% Videos
- 15% Case studies
- 15% Exercises & Quizes.
- 10% Discussions

Course code: (TPR0018)