Training Course on Safety Instrumentation and Emergency Shut-down Systems

Professional Development Training Course Outline

Category	Development	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

In today’s rapidly evolving industrial landscape, process safety and asset integrity have become non-negotiable priorities. Training Course on Safety Instrumentation and Emergency Shut-down (ESD) Systems provides an in-depth understanding of the engineering principles, regulatory requirements, and modern technologies associated with functional safety, SIL (Safety Integrity Level), and automated protection systems. This course is designed to meet the current industrial demands for safer operations and risk mitigation, ensuring compliance with IEC 61508, IEC 61511, and industry-specific safety standards.

Participants will gain practical knowledge in the design, operation, and maintenance of Safety Instrumented Systems (SIS), Emergency Shut-down Systems, and related protective layers. The course integrates real-world case studies, hands-on assessments, and fail-safe system simulations to reinforce critical safety concepts. Professionals in oil & gas, petrochemicals, power, and manufacturing sectors will find this training crucial in achieving operational excellence, reducing hazards, and supporting environmental, health, and safety (EHS) performance.

Programme Curriculum

Training Course on Safety Instrumentation and Emergency Shut-down Systems

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Course Objectives

1. Understand Safety Instrumented Systems (SIS) architecture and components
2. Learn the role of Emergency Shut-down Systems (ESD) in process safety
3. Analyze Safety Integrity Level (SIL) requirements using risk graphs and LOPA
4. Apply IEC 61508 and IEC 61511 compliance in real-time systems
5. Design and configure fail-safe control systems for high-risk environments
6. Evaluate hazard and risk assessment techniques in industrial operations
7. Implement alarm management strategies for safety-critical operations
8. Understand the lifecycle of functional safety systems
9. Assess HIMA, Triconex, and DeltaV SIS platforms
10. Integrate cybersecurity in safety systems for critical infrastructure
11. Perform proof testing and validation of safety systems
12. Explore redundancy and reliability modeling for SIS
13. Examine root cause analysis for system shutdown failures

Target Audience

1. Process Safety Engineers
2. Instrumentation & Control Engineers
3. Plant Managers and Supervisors
4. Automation Specialists
5. Maintenance Engineers
6. HSE Professionals
7. Project Engineers in Oil & Gas
8. Technical Safety Consultants

Course Duration: 5 days

Course Modules

Module 1: Fundamentals of Safety Instrumented Systems (SIS)

- Introduction to SIS and ESD systems
- Role of SIS in process safety management
- Hardware and software components
- Regulatory framework (IEC 61508, 61511)
- System architecture: simplex, duplex, triplex
- **Case Study:** SIS failure in a petrochemical facility

Module 2: Safety Integrity Levels (SIL) & Risk Assessment

- SIL determination techniques (LOPA, Risk Graphs)
- SIL validation and verification
- Probability of Failure on Demand (PFDavg)
- Impact of SIL on design and cost
- Risk-based approach to protection layers
- **Case Study:** LOPA analysis in an oil refinery

Module 3: Design and Engineering of ESD Systems

- ESD logic diagrams and design tools
- Redundancy and fail-safe logic design
- SIF (Safety Instrumented Functions) development
- I/O allocation and logic solver configuration
- Integration with PLCs and DCS
- **Case Study:** ESD activation in a gas compressor station

Module 4: Functional Safety Lifecycle Management

- Phases of the safety lifecycle
- Safety requirement specifications (SRS)
- Operation and maintenance planning
- Change management and documentation
- Decommissioning and disposal considerations
- **Case Study:** Lifecycle audit of a chemical plant SIS

Module 5: SIS Maintenance, Testing & Validation

- Inspection and test procedures
- Proof testing interval optimization
- Degraded mode operation and bypasses
- Maintenance best practices
- Failure recording and analysis
- **Case Study:** SIS validation in an LNG facility

Module 6: Alarm Management and Human Factors

- Alarm design and prioritization
- Operator response times and workload
- Nuisance alarms and rationalization
- Human-Machine Interface (HMI) design
- Alarm shelving and suppression strategies
- **Case Study:** Alarm overload during emergency shutdown

Module 7: Safety Systems Platforms & Technology Integration

- Overview of Triconex, DeltaV, and HIMA
- Communication protocols and system diagnostics
- SIS integration with SCADA and DCS
- Smart instruments and digitalization
- Cybersecurity measures for SIS
- **Case Study:** Integration of Triconex with SCADA in offshore rig

Module 8: Incident Investigation and Reliability Analysis

- Root Cause Analysis (RCA) methods
- FMEA and Fault Tree Analysis (FTA)
- Reliability Block Diagrams (RBD)
- Quantitative Risk Assessment (QRA)
- Corrective and preventive actions
- **Case Study:** RCA on an unplanned ESD system trip

Training Methodology

- Instructor-led presentations and real-time demonstrations

- Hands-on sessions with industry-standard SIS tools
- Interactive discussions and Q&A with subject matter experts
- Group assignments, SIL assessment exercises, and quizzes
- Practical case study reviews and safety drills

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	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Physical	$6,000

Ready to enroll or request a customized program? Book online or contact us:

Register Online Now

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