**Module Details**

**Module 14: Practical Safety Instrumentation and Emergency Shutdown Systems for Process Industries Using IEC 61511 and IEC 61508**

Nominal duration: 4 weeks (48 hours total time commitment)

This time commitment includes the preparation reading, attendance at each webinar (1 hour plus 15-30 minutes for discussion), and the time necessary to complete the assignments and further study.

**Module Purpose**

This module covers the management, planning and execution of automatic safety systems in accordance with IEC 61511 and IEC 61508.

**Pre-Requisites**

Module 13

**Co-Requisites**

**Assessment Strategy**

To evaluate the achievement of the learning outcomes; written assignments, group projects and practical exercises are set.

**Summary of Learning Outcomes**

1. Examine and discuss safety instrumented systems from a managerial perspective
2. Outline the procedures for specifying safety requirements
3. Outline the procedures for selecting safety system equipment
4. Outline the procedures for performance evaluation, testing, and maintenance of safety systems

**Learning Outcome 1**

Examine and discuss safety instrumented systems from a managerial perspective

**Assessment Criteria**

1.1 Examine the principles of safety-instrumented systems, in particular:
(a) Risk reduction
(b) Safety Integrity Levels
(c) Essential design and performance requirements of safety control systems
### Learning Outcome 1

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| 1.2 | Outline the scope, application and principal requirements of:  
(a) IEC61508  
(b) IEC 61511 |
| 1.3 | Examine the essential features of safety PLCs |
| 1.4 | Examine the concept of the safety life cycle |

### Learning Outcome 2

**Outline the procedures for specifying safety requirements**

### Assessment Criteria

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| 2.1 | Compare the relationship between:  
(a) Hazard analysis  
(b) Risk assessment  
(c) The safety requirements specification |
| 2.2 | Examine the following methods for risk reduction:  
(a) Demand Mode  
(b) Continuous Mode |
| 2.3 | Examine the application of the following methods for determination of SIL targets:  
(a) LOPA  
(b) Risk Graph |
| 2.4 | Illustrate the concepts of:  
(a) Fault tolerance  
(b) Redundant architectures |

### Learning Outcome 3

**Outline the procedures for selecting safety system equipment**

### Assessment Criteria

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<td>3.1</td>
<td>Outline the essential features of field devices</td>
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<td>3.2</td>
<td>Examine the issues related to selection and certification of equipment</td>
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<td>3.3</td>
<td>Examine the basic operation of Safety PLCs</td>
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### Learning Outcome 4

| 3.4 | Compare examples of safety related application software and tools |

### Assessment Criteria

| 4.1 | Examine the concept of basic reliability analysis and how it benefits the end user |
| 4.2 | Examine how improved performance is obtained through diagnostics and proof testing |
| 4.3 | Outline the benefits of safety certified and smart instruments |

### Delivery mode

A combination of asynchronous and synchronous e-learning delivery comprising a judicious mix of interactive online web conferencing, simulation (virtual labs) software, remote online labs, online videos, PowerPoint slides, notes, reading and study materials (in PDF, HTML and Word format) accessed through the Moodle Learning Management System (LMS).