

**xSeriCon**  
**PHA111 – Layer of Protection Analysis – Modular**

**Course description**

PHA111 is xSeriCon's distance learning course on Layer of Protection Analysis (LOPA). It is provided in the form of 4 standalone modules for self-study with optional tutor support. Visit <https://www.xsericon.world> for details of the time required to complete each module, tutor support available, pricing, and sample materials for free download.

**Introduction**

This course provides in-depth coverage of the theory and practice of Layer of Protection Analysis (LOPA) as typically applied in the process industries. The course explains the underlying principles of process risk management; the purpose and application of LOPA as a risk assessment tool; and detailed coverage of LOPA in practice. Desktop exercises and a practical case study will be completed during the course. Some prior knowledge of the concepts of hazard and risk would be preferable.

The course is written by a qualified professional with extensive experience of chairing and auditing LOPA studies.

**COURSE OBJECTIVE**

The objective is to prepare attendees to:

- determine whether LOPA is the appropriate risk assessment tool for a given situation; and
- participate in, and lead, LOPA workshops.

**TARGET AUDIENCE**

The course is designed for any engineering and operational personnel required to participate in risk assessment activities. It is particularly suitable for the following functions:

- Operations manager, team leader
- HSE engineer or manager
- Process engineer
- Control and instrument engineer
- Personnel and consultants preparing to become a LOPA study leader

**LEARNING OBJECTIVES**

- Understand the concepts of risk quantification
- Know how to select a tolerable risk level for a given hazardous scenario
- Be aware of a range of risk calculation tools and how to select the appropriate tool
- Understand the structure of a LOPA calculation
- Know how to source appropriate input data for LOPA
- Know how to handle multiple types of initiating event leading to the same incident
- Understand rules for enabling conditions and conditional modifiers

- Understand how to determine if a layer of protection is operating in ‘demand mode’ or ‘continuous mode’
- Understand how to apply correct LOPA methodology for demand and continuous modes
- Be able to execute a complete LOPA study for straightforward cases as part of a LOPA study team

## COURSE OUTLINE

Section	Section title	Topics covered
1	Concepts of risk analysis	<ul style="list-style-type: none"> <li>• Risk as a function of frequency and severity</li> <li>• Risk per incident or per individual</li> <li>• Tolerable risk</li> <li>• The chain of events: from root cause to outcome</li> <li>• Selecting cases to analyse with LOPA</li> </ul>
2	The elements of LOPA	<ul style="list-style-type: none"> <li>• The LOPA workshop</li> <li>• A simple LOPA worksheet</li> <li>• Initiating events</li> <li>• Enabling factors</li> <li>• Independent protection layers</li> <li>• Conditional modifiers</li> <li>• Mitigated frequency</li> </ul>
3	Getting from unmitigated risk to SIL target	<ul style="list-style-type: none"> <li>• Obtaining event frequency and failure probability data</li> <li>• Demand mode functions</li> <li>• Continuous mode functions</li> <li>• LOPA and ALARP</li> <li>• Combining multiple initiating events</li> </ul>
4	Advanced LOPA concepts	<ul style="list-style-type: none"> <li>• Semi-quantitative LOPA</li> <li>• Multiple outcomes of differing severities</li> <li>• Validity of layers of protection</li> <li>• Another SIF as a layer of protection</li> <li>• Documenting LOPA</li> <li>• Use of LOPA for estimating demand rate of SIFs</li> <li>• Combining HAZOP and LOPA</li> <li>• From LOPA to Fault Tree Analysis</li> </ul>