

# **AMSE26 ADVANCED SAFETY ENGINEERING AND MANAGEMENT**

## **UNIT-1 DOMINO INCIDENT INVESTIGATION**

- 1.1 Technique, logic diagram,
- 1.2 Input requirements, output, and example.
- 1.3 Unavailability analysis of protective systems
- 1.4 Technique, logic diagram, input requirements, example.
- 1.5 Reliability analysis of automatic control systems
- 1.6 PES safety system development logic diagram, system analysis,
- 1.7 Calculation of fractional dead time, application, strengths and weaknesses.
- 1.8 Introduction to MORT analysis, IFAL analysis,
- 1.9 Markov processes and application of Markov modeling to safety instrumented systems,
- 1.10 Sneak analysis.

## **UNIT-2 BEHAVIOUR- BASED SAFETY**

- 2.1 Fundamentals of BBS Management
- 2.2 Identification- Situation, Behavior or Act
- 2.3 Mental Capacity of Creating or Eliminating an Unsafe Act
- 2.4 Attitudes that Affect Behaviour
- 2.5 Establishing Self- Supporting Behavioral Safety
- 2.6 Critical Error Reduction Techniques
- 2.7 Accident Prevention and Investigation:
- 2.8 Critical Information Sharing
- 2.9 Situational Awareness- Identification versus Reaction,
- 2.10 Accountability and Responsibility
- 2.11 Who Pays for Inattention?

## **UNIT-3 SECURITY FOR CHEMICAL PROCESS INDUSTRIES**

- 3.1 Assessments and regulatory environment, methods for assessing security vulnerability,
- 3.2 Emerging security regulations,
- 3.3 Government development and industry activities that relate to security for process facilities.
- 3.4 Strategies and counter measures
- 3.5 Prevention of intentional releases and theft of chemical releases at process facilities.
- 3.6 Site security for process industries
- 3.7 Essential elements- threat analysis, security counter measures, mitigation and emergency response.
- 3.8 Specific security measures- information security, cyber security, physical security,
- 3.9 Policies and procedures, training, mitigation and response, and inherently safer processes.

## **UNIT-4 SAFETY MANAGEMENT SYSTEMS**

- 4.1 SHEMS, OHSAS 18001 and OSHA's PSM

- 4.2 Policy, planning, training,
- 4.3 Implementation, and management control and review.
- 4.4 Layer of Protection Analysis (LOPA)
- 4.5 Overview of relevant standards and guidelines, risk tolerance criteria.
- 4.6 Preparation of LOPA- LOPA methodology, the LOPA team.
- 4.7 Scenario development- components, inherently safe considerations.
- 4.8 Initiating causes / effects- identification, estimation of frequencies.
- 4.9 Independent protection layers- IPL criteria, allocation of IPL credit-
- 4.10 Basic process control systems, operator response, pressure relief device,
- 4.11 Safety instrumented system, and safety instrumented function.
- 4.12 Safety integrity level (SIL) assignment,
- 4.13 Interpreting LOPA results and making recommendations.

**Reference Books:**

1. Centre for Chemical Process Safety, AIChE: Guidelines for Chemical Process Quantitative Risk Analysis, second edition, 2000.
2. ACC: Site Security Guidelines for the U.S Chemical Industry, American Chemistry Council, Washington DC, 2001.
3. Thomas R. Krause, The Behaviour – Based Safety Process: Managing involvement for an injury-free culture, 2nd edition, John Wiley & Sons, 1996.

