

Liverpool John Moores University

Title: Nuclear Probabilistic Safety Assessment (PSA)
Status: Definitive
Code: **7560RTC** (120393)
Version Start Date: 01-08-2019

Owning School/Faculty: Maritime and Mechanical Engineering
Teaching School/Faculty: Risktec Solutions

Team	Leader
Alan Wall	Y

Academic Level: FHEQ7
Credit Value: 10
Total Delivered Hours: 16.5
Total Learning Hours: 100
Private Study: 83.5

Delivery Options

Course typically offered: Semester 1

Component	Contact Hours
Lecture	8
Online	.5
Tutorial	8

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Essay	AS1	An essay question comprising several component parts, based around a case study, up to 4,000 words long.	95	
Test	AS2	Individual and group activities e. g. quiz, forum	5	

Aims

To enable students to understand and apply PSA techniques with particular relevance to the nuclear industry.

Learning Outcomes

After completing the module the student should be able to:

- 1 Critically review the legal and regulatory obligations placed on the owners of a nuclear plant to demonstrate that the risks posed to people and the environment by operation of their plant are both tolerable and "as low as reasonably practicable".
- 2 Demonstrate a thorough grounding in the theory and concepts that are embedded within PSA.
- 3 Deduce the PSA techniques appropriate to a real-life nuclear plant and hence evaluate the risks associated with the operation and design of that plant.
- 4 Identify and critically examine any additional measures that may be required to ensure that the risks are both tolerable and ALARP.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

4000 word essay	2	3	4
Individual and group work	1		

Outline Syllabus

Introduction to safety assessment in the nuclear industry
Safety Assessment, Guidelines and Principles
Reliability Theory and Concepts
System Reliability and Modelling
Fault and hazard identification, including
Failure Modes and Effects Analysis
Hazard and Operability Studies (HAZOP)
Frequency analysis
Event Tree Analysis
Fault Tree Analysis
Supporting data, including
Reliability data
Dependent failures
Human Factors
Consequence analysis in the nuclear industry
Hazards PSA
Application of results, including ALARP demonstration

Learning Activities

A combination of lectures, exercises and supported self study.

Notes

The purpose of this module is to enable students to understand and apply Probabilistic Safety Assessment (PSA) techniques with particular relevance to the nuclear industry. The module will give an overview of the nuclear industry safety assessment guidelines and principles. Reliability theory and system modelling will be covered, including event tree and fault tree analysis (although more detail on this is in a separate module). Consequence modelling in the nuclear industry and typical hazard scenarios such as fire, aircraft crash, natural hazards, etc. will also be discussed. The module includes application of PSA results and demonstration of ALARP.

Assessment is in the form of an essay combined with activities (e.g. exercises, discussions, etc.). The delivery modes for the module elements are explained below.

Lecture (using slides and notes): will be delivered by classroom based teacher (face to face) or online self-study (distance learning) or mixture of the two (blended learning).

Tutorial/Activities (exercises and reviews): will be delivered by classroom based teacher (face to face) or online activities with teacher feedback/virtual classroom (distance learning) or mixture of the two (blended learning).

Tutor supported online: will be delivered by email support prior to assessment submission (face to face) or tutor feedback activities, virtual classrooms and email support (distance learning) or mixture of the two (blended learning).