**Liverpool** John Moores University

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| Title: | PROBABILISTIC SAFETY ASSESSMENT (PSA) IN NUCLEAR INDUSTRIES |
| Status: | Definitive |
| Code: | **7507ENGRSK**   (113872) |
| Version Start Date: | 01-08-2019 |

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| Owning School/Faculty: | Engineering |
| Teaching School/Faculty: | Risktec Solutions |

| Team | Leader |
|---|---|
| Alan Wall | |

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| **Academic Level:** | FHEQ7 | **Credit Value:** | 10 | **Total Delivered Hours:** | 16 |
| **Total Learning Hours:** | 100 | **Private Study:** | 84 | | |

**Delivery Options**

Course typically offered: Runs Twice - S1 & S2

| Component | Contact Hours |
|---|---|
| Lecture | 8 |
| 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, typically 3,000 words long. | 60 | |
| Technology | AS2 | | 40 | |

**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 expertise of 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. The student should 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:

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|---|---|---|
| An essay question in parts | 1 | 2 |
| PSA techniques | 3 | |

**Outline Syllabus**

*Introduction to safety assessment in the nuclear industry*
*Safety Assessment, Guidelines and Principles*
*Reliability Theory and Concepts*
*System Reliability and Modelling (more detail in Availability, Reliability, Maintainability (ARM) Analysis module)*
*Fault and hazard identification, including:*

*• Failure Modes and Effects Analysis*

*• Hazard and Operability Studies (HAZOP) (more detail in HAZOP module)*
*Frequency analysis*

*• Event Tree Analysis (more detail in Event Tree and Fault Tree Analysis Module)*

*• Fault Tree Analysis (more detail in Event Tree and Fault Tree Analysis Module)*
*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 lecture and exercises during the taught session, and supported self study.

**Notes**

The purpose of this module is to enable students to understand and apply 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 concepts and system reliability and 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.

The assessment for this module is a combination of essay and technological task..