Param Level 8 International Diploma in Process Safety Management (PSM)

About Param Qualifications

Param Qualifications provides academic and vocational qualifications designed to meet international professional standards and evolving industry needs. Our commitment to the development and delivery of high-quality qualifications is underpinned by a focus on consistency, integrity, and continuous improvement across all programmes.

Param Qualifications develops qualifications that are accessible to all learners who have the potential to achieve the required standards. We promote equality, diversity, and inclusion at every stage of the qualification lifecycle, ensuring that learners are not disadvantaged by barriers that may restrict access, participation, or progression.

Delivery Centres offering our qualifications are required to operate fair, transparent, and consistent policies, provide appropriate learner support, and ensure that all assessment decisions are valid, reliable, and standardised. Centres are also expected to recognise prior learning where appropriate, enabling learners' existing knowledge, skills, and experience to be considered when accessing qualifications.

Param Qualifications maintains a strong duty of care towards learners, employers, and stakeholders through robust quality assurance processes. These processes are designed to safeguard the integrity of assessment outcomes, support continuous improvement, and ensure that qualifications remain relevant, credible, and aligned with current professional and industry practices.

Supporting Diversity

Param Qualifications and its Delivery Centres value individual differences and are committed to promoting equality, diversity, and inclusion. We aim to remove barriers to learning and ensure fair access for all learners, regardless of age, gender, disability, religion, cultural background, or other protected characteristics.

Learner Voice

Learners are central to Param Qualifications' quality improvement processes. We actively encourage learner feedback to ensure that teaching, learning, and assessment practices remain effective, relevant, and responsive.

Feedback is gathered through structured surveys, evaluations, and ongoing engagement between learners, tutors, and Delivery Centre staff. This enables Param Qualifications to identify areas for enhancement, recognise good practice, and continually raise standards.

By providing opportunities for learners to share their views and experiences, we ensure that our qualifications reflect learner expectations and support a positive, inclusive, and engaging learning experience.

Contents

Introduction

Why Choose Param Qualifications?

Param Qualifications' programmes are designed to provide learners with advanced opportunities for professional development, strategic leadership, and career progression in high-hazard and complex industrial environments. The qualifications support learners in achieving their full potential by developing advanced analytical, evaluative, and decision-making capabilities in process safety management.

The objectives of this qualification are to:

- To develop advanced strategic, analytical, and leadership capability in process safety management within high-hazard industries and complex organisational contexts.
- To enable learners to critically evaluate process safety systems, governance frameworks, and major accident risks to support strategic decision-making.
- To support the application of professional judgement and leadership in preventing major accident hazards (MAH) and improving organisational process safety performance.

Param Qualifications programmes integrate advanced theoretical knowledge with applied professional practice in process safety management. Learners will critically examine how high-risk industries operate, manage major hazards, respond to internal and external pressures, and maintain resilience in uncertain and rapidly evolving environments.

Through this qualification, learners will develop the ability to:

- Critically evaluate process safety systems, major hazard risks, and governance within complex industrial environments
- Develop and apply evidence-based solutions to complex process safety challenges in high-hazard industries
- Exercise strategic leadership, professional judgement, and accountability in managing major accident risks
- Synthesise information from diverse technical, operational, and regulatory sources to support organisational improvement
- Undertake independent research and apply findings to enhance process safety performance and professional practice

Employer Support for Qualification Development

The development of this qualification has been informed through consultation with employers, industry professionals, and training providers operating within high-hazard and process industries. Their input has ensured that the qualification reflects current industry expectations, regulatory requirements, and emerging global workforce demands in process safety management.

Feedback from employers identified a growing demand for highly skilled professionals capable of leading process safety strategies, managing major accident hazards (MAH), ensuring regulatory compliance, and maintaining robust process safety management systems within complex industrial environments. Employers also highlighted the importance of integrating engineering, operational, and organisational controls to prevent catastrophic incidents and enhance overall system reliability.

Qualification Title

This programme is titled:
Param Qualifications Level 8 International Diploma in Process Safety Management (PSM)

This qualification is positioned at Level 8, reflecting advanced knowledge at the forefront of process safety management, together with critical evaluation, strategic leadership capability, and independent research competence. It is designed to prepare learners for senior leadership roles within high-hazard industries and progression to doctoral-level academic study.

The qualification is aligned with Level 8 descriptors, requiring learners to demonstrate originality in the application of knowledge, the ability to generate new insights, and the capacity to address complex and unpredictable challenges associated with major accident hazards (MAH) and process safety systems. Learners are expected to exercise a high level of autonomy, professional judgement, and strategic decision-making in both academic and professional contexts.

Each unit within the qualification carries a defined credit value and is aligned with internationally recognised postgraduate and advanced-level study expectations. The qualification includes a substantial research component, enabling learners to design, undertake, and apply independent research that contributes to the advancement of professional practice and knowledge in process safety management.

This qualification is designed as a pre-doctoral programme, supporting progression to higher-level research qualifications such as Doctor of Business Administration (DBA), Doctor of Philosophy (PhD), or equivalent professional doctoral programmes, particularly within engineering, safety, and high-hazard industry disciplines.

Upon successful completion, learners will be awarded the full diploma by Param Qualifications Limited. The qualification has been developed in alignment with recognised quality principles to ensure validity, reliability, comparability, manageability, and minimisation of bias across delivery and assessment.

Qualification Purpose and Outcomes

Qualification Purpose

The Level 8 International Diploma in Process Safety Management (PSM) is designed for professionals who are currently operating in, or aspiring to, senior leadership roles within high-hazard industries such as oil and gas, chemicals, energy, and manufacturing. It is intended for learners who are responsible for designing, leading, and transforming organisational process safety strategies and systems within complex and dynamic industrial environments.

This qualification equips learners with advanced expertise required for senior-level professional practice in process safety management, while also developing the capacity to extend knowledge, generate new insights, and contribute to the advancement of process safety and major accident prevention practices.

Centres and learners are expected to benefit significantly from this programme through the development of advanced technical knowledge, strategic capability, and applied professional skills in managing major accident hazards (MAH). The qualification promotes both academic and professional development, enabling learners to operate with a high level of autonomy and professional judgement in complex, high-risk, and unpredictable contexts.

The purpose of this qualification is aligned to Level 8 descriptors. Learners will develop advanced knowledge at the forefront of process safety management, with critical awareness of complex issues related to system integrity, risk modelling, and regulatory compliance. Learners will demonstrate originality in problem-solving and undertake independent research activities that contribute to professional practice, organisational performance, and continuous improvement in high-hazard industries.

The qualification emphasises strategic leadership, innovation, and the ability to influence organisational process safety outcomes, while preparing learners for progression to higher-level academic study, including doctoral-level research. The qualification adopts a research-led approach, enabling learners to develop advanced investigative capability and contribute to the advancement of process safety management practice.

Learning Outcomes

The qualification aims:

1. To enable learners to develop advanced analytical and evaluative capability in process safety management within complex and high-hazard industrial environments
2. To enable learners to critically evaluate and synthesise process safety management systems, governance frameworks, and organisational performance to support strategic decision-making
3. To develop learners' ability to formulate and apply advanced methodologies and approaches to address complex, high-risk, and unpredictable major accident hazard (MAH) scenarios
4. To ensure learners can initiate, design, and undertake independent research and strategic activities that demonstrate originality and contribute to the advancement of process safety management practice and knowledge
5. To enable learners to critically evaluate legal, regulatory, ethical, and organisational factors and their short- and long-term implications within process safety and high-hazard industry contexts
6. To enable learners to exercise autonomy, leadership, and professional judgement to influence organisational performance, enhance process safety outcomes, and generate new insights in process safety management

Entry Requirements

To ensure that learners are able to successfully engage with and complete this Level 8 qualification, applicants are expected to meet the following entry criteria:

Academic Requirements

Applicants should normally:

- Hold a Master's degree or equivalent Level 7 qualification in process safety, chemical engineering, mechanical engineering, industrial engineering, occupational health and safety, risk management, or a related discipline
- Or possess an equivalent recognised qualification that demonstrates advanced academic capability and technical understanding relevant to high-hazard industries

Professional Experience

Applicants are expected to:

- Have a minimum of 3 years' relevant professional experience in process safety, engineering, oil and gas, petrochemical, chemical, energy, manufacturing, or other high-hazard industries
- Ideally be working in, or have experience of, senior, technical, or strategic-level roles where they can apply advanced knowledge in managing major accident hazards (MAH), system integrity, or operational risk

Research Capability and Context

Given the advanced and research-led nature of this qualification, applicants should:

- Be able to demonstrate access to a relevant organisational or industrial context to support applied research in process safety or high-hazard environments
- Have the capacity to undertake independent research activities, including the completion of a substantial research project

English Language Requirements

Where English is not the applicant's first language, they must demonstrate proficiency through one of the following:

- An academic qualification that was taught and assessed in English
- Or an English language qualification equivalent to:
    - IELTS 6.5 (or equivalent)
    - Or other recognised international English language standards

Qualification Structure and Requirements

Credits and Total Qualification Time (TQT)

The Param Qualifications Level 8 International Diploma in Process Safety Management (PSM) consists of 180 credits, which equates to an estimated 1800 hours of Total Qualification Time (TQT).

The qualification is structured across 10 units, including:

- 6 mandatory units
- 4 optional units, of which learners must select any 2 units

Each standard unit carries 20 credits, and the research project unit carries 40 credits. To achieve the full qualification, learners must successfully complete all mandatory units and the required combination of optional units to achieve a total of 180 credits. The indicative duration for completion of this qualification is typically between 12 to 18 months.

Unit No.	Unit Title	Level	Credit Value	TQT (Hours)	GLH (Hours)	Unit Type
1	Strategic Process Safety Leadership, Culture and Governance	8	20	200	100	Mandatory
2	Process Safety Management Systems and Organisational Integration	8	20	200	100	Mandatory
3	Advanced Process Hazard Analysis and Quantitative Risk Modelling	8	20	200	100	Mandatory
4	Safety Integrity, Reliability and Functional Safety Engineering	8	20	200	100	Mandatory
5	Major Accident Prevention, Regulatory Strategy and Compliance	8	20	200	100	Mandatory
6	Applied Research Project in Process Safety Management	8	40	400	200	Mandatory
7	Digital Transformation, AI and Predictive Process Safety	8	20	200	100	Optional
8	Emergency, Crisis Management and Organisational Resilience	8	20	200	100	Optional
9	Incident Intelligence, Investigation and Organisational Learning	8	20	200	100	Optional
10	Asset Integrity and Reliability Management in High-Hazard Industries	8	20	200	100	Optional

Total Qualification Credits: 180 Credits

Total Qualification Time (TQT): 1800 Hours

Total Guided Learning Hours (GLH): 900 Hours

Total Qualification Time (TQT)

Total Qualification Time (TQT) represents the estimated amount of time required for a learner to achieve the qualification. This includes all learning and assessment activities.

Examples of activities contributing to TQT include:

- Guided learning and tutor-led sessions
- Independent study and research
- Preparation of assignments and reports
- Work-based learning activities
- E-learning and digital learning activities
- Assessment preparation and completion

Guided Learning Hours (GLH)

Guided Learning Hours (GLH) refer to the time spent under the direct guidance of a tutor or trainer. This includes:

- Lectures, seminars, and tutorials
- Supervised study sessions
- Live online learning (e.g., webinars)

- Tutor-supported e-learning
- Supervised assessment activities

Rules of Combination

To achieve the qualification, learners must:

- Successfully complete all 6 mandatory units, and complete any 2 optional units from the available options
- This ensures that learners achieve the required total of 180 credits

Achievement Requirements

Learners must demonstrate that they have met all learning outcomes and assessment criteria for each unit undertaken in order to achieve the qualification.

Assessment is conducted through internally assessed assignments, which are reviewed and quality assured to ensure consistency, validity, and reliability.

Staffing Requirements and Competence

Staff involved in the delivery, assessment, and internal quality assurance of the qualification must be appropriately qualified, experienced, and competent to support learning at Level 8 within process safety and high-hazard industry contexts.

Delivery Centres must ensure that staff:

- Possess relevant academic or professional qualifications, typically at Level 7 or above, in process safety, engineering, occupational health and safety, management, or a related discipline
- Have substantial and recent occupational or professional experience within process safety management, high-hazard industries (e.g., oil and gas, chemicals, energy), or related fields
- The level of experience should be sufficient to support learners undertaking advanced study, including strategic-level work, system design, and independent research activities in process safety
- Staff are required to engage in ongoing Continuing Professional Development (CPD) to ensure that their knowledge, skills, and professional practice remain current and relevant to industry developments

Where appropriate, Delivery Centres should ensure that staff involved in supporting research-based units, particularly the Applied Research Project in Process Safety Management, have experience in supervising or guiding postgraduate-level research or equivalent professional or technical activity.

Internal Quality Assurers (IQAs)

Internal Quality Assurers are responsible for monitoring the quality and consistency of assessment decisions within the Delivery Centre.

IQAs must:

- Have appropriate knowledge, experience, and competence in internal quality assurance processes
- Must hold, or be working towards, a Level 4 qualification in the internal quality assurance of assessment processes and practice, or an equivalent recognised qualification
- Be familiar with the qualification structure, learning outcomes, and assessment requirements
- Support standardisation activities to ensure consistency across assessors

Continuing Professional Development (CPD)

Delivery Centres are expected to support the ongoing professional development of their staff to ensure that knowledge and practice remain current and relevant.

Staff should engage in continuing professional development activities that:

- Maintain and enhance subject knowledge and technical competence in process safety, engineering systems, and high-hazard industry practices
- Support effective teaching, learning, and assessment practices at advanced (Level 8) standards
- Reflect current developments in process safety management, including regulatory changes, technological advancements, and industry best practice

Centres should retain appropriate records of CPD activity to demonstrate ongoing staff development and capability.

Progression

Successful completion of the Param Qualifications Level 8 International Diploma in Process Safety Management (PSM) enables learners to progress to:

This qualification is designed to support progression to advanced academic study, including doctoral-level programmes, subject to the entry requirements of the receiving institution.

This qualification supports both academic progression and research-based programmes, including doctoral-level study, by developing learners' ability to formulate research proposals, undertake independent investigation, and contribute to academic and professional knowledge in process safety management.

Delivering the Qualification

Delivery Centres intending to offer Param Qualifications programmes are required to complete an approval process prior to delivery. This process is designed to ensure that centres have the appropriate systems, resources, and expertise in place to support effective teaching, learning, and assessment at Level 8.

Delivery Centres must demonstrate that they:

- Have suitably qualified and experienced staff to deliver, assess, and internally quality assure the qualification, with relevant expertise in process safety, engineering, or high-hazard industries
- Provide access to appropriate learning resources and facilities that support learner achievement, including technical, digital, and research-based resources relevant to process safety management
- Operate clear and consistent procedures for learner support, assessment, and internal quality assurance
- Are able to maintain accurate records of learner progress, assessment decisions, and quality assurance activity

Param Qualifications will review and approve Delivery Centres based on their ability to meet these requirements. Centres are expected to maintain these standards throughout the delivery of the qualification.

Assessment

This qualification is assessed through internally assessed assignments, projects, and applied professional tasks designed to reflect realistic and complex process safety and high-hazard industry scenarios, including major accident hazard (MAH) contexts.

Assessment is criterion-referenced and based on the achievement of all specified learning outcomes and assessment criteria for each unit. Learners are required to demonstrate evidence of achievement through written work, applied analysis, technical evaluation, and research-based activities relevant to process safety management.

To achieve a pass, learners must provide sufficient, valid, and reliable evidence to meet all learning outcomes and associated assessment criteria. Assessment decisions are made by assessors based on the quality, depth, and completeness of evidence presented.

Assessors are responsible for:

- Evaluating learner evidence against the defined assessment criteria
- Making consistent and informed assessment judgements
- Providing clear and constructive feedback to support learner development

Assessment decisions must be supported by an appropriate audit trail, demonstrating how judgements have been reached in relation to the learning outcomes and assessment criteria. Assessment activities include research-based tasks, technical analysis, and applied investigation, enabling learners to demonstrate independent inquiry, critical evaluation, and problem-solving in process safety contexts.

Delivery Centres are required to implement internal quality assurance processes to ensure that assessment decisions are consistent, valid, and reliable. This includes internal verification, standardisation activities, and regular review of assessment practices.

Param Qualifications may implement external quality assurance arrangements to monitor the effectiveness of assessment and internal quality assurance processes across Delivery Centres. This is intended to ensure that standards are maintained and that learners are assessed fairly and consistently.

Assessment materials and guidance will be provided to Delivery Centres to support consistent delivery and assessment. Centres are expected to apply these requirements in a transparent and standardised manner.

Opportunities for Learners to Achieve

Delivery Centres are responsible for supporting learners who do not initially meet the required standards. Centres must provide clear and constructive feedback, enabling learners to improve their performance and, where appropriate, undertake reassessment.

Recognition of Prior Learning (RPL)

Recognition of Prior Learning (RPL) is a method of assessment that enables learners to demonstrate achievement of learning outcomes through knowledge, understanding, or skills they have already acquired. This avoids unnecessary repetition of learning.

Param Qualifications encourages Delivery Centres to recognise learners' prior achievements and experiences, whether gained through employment, training, independent study, or previous formal qualifications. RPL supports continuous learning and ensures fair and inclusive access to the qualification.

RPL may be applied where valid evidence demonstrates that the assessment requirements of a unit or qualification have been fully met. Acceptable forms of evidence may include workplace documentation, prior qualifications, project work, reflective accounts, or direct observation.

All RPL evidence must be:

- Valid – directly aligned to the learning outcomes
- Authentic – produced by the learner
- Sufficient – comprehensive enough to meet requirements
- Reliable – capable of verification

Delivery Centres must apply Param Qualifications' RPL policy consistently to ensure fairness and transparency.

Equality and Diversity

Param Qualifications recognises that discrimination, harassment, and victimisation are unacceptable. We are committed to promoting fairness, respect, and equal opportunity across all areas of our operations.

It is our aim to ensure that no learner, employee, or representative of Param Qualifications receives less favourable treatment, either directly or indirectly, on the grounds of age, disability, gender, gender reassignment, marriage or civil partnership, pregnancy or maternity, race, religion or belief, sex, or sexual orientation.

Param Qualifications aims to create an inclusive environment in which learners and staff feel respected, valued, and able to achieve their full potential. We actively promote equality, diversity, and inclusion, and work to identify and remove barriers that may restrict access, participation, or progression.

Delivery Centres and learners may access the Equality and Diversity Policy through official Param Qualifications communication channels.

This qualification is designed to align with the principles of the Equality Act 2010 and ensures that learners are not disadvantaged by artificial barriers to entry, delivery, or assessment.

Unit Specification

Strategic Process Safety Leadership, Culture and Governance

Unit Name: Strategic Process Safety Leadership, Culture and Governance
Unit Number: PSM801
Unit Level: 8
No.of credits: 20
Mandatory/ Optional: Mandatory

Unit Aim

The aim of this unit is to develop advanced knowledge and critical understanding of strategic leadership, organisational culture, and governance within process safety management (PSM). The unit enables learners to critically evaluate leadership approaches, governance frameworks, and cultural factors influencing major hazard risk control, and to design and implement strategic interventions that enhance process safety performance, organisational resilience, and accountability in high-hazard industries.

Learning Outcomes, Assessment Criteria

Learning Outcomes (LO)- Will be able to	Assessment Criteria (AC)- Learner can:
1. Be able to evaluate strategic leadership in process safety management	1.1 Critically analyse contemporary leadership theories in the context of process safety management
	1.2 Evaluate the role of strategic leadership in preventing major accident hazards (MAH)
	1.3 Critically assess decision-making approaches in complex and high-risk process environments
	1.4 Synthesise leadership strategies to enhance organisational process safety performance
2. Be able to analyse process safety culture and behavioural factors	2.1 Critically evaluate models of process safety culture and maturity
	2.2 Analyse behavioural safety and human factors influencing process safety outcomes
	2.3 Evaluate the role of workforce competence and engagement in MAH prevention
	2.4 Critically assess strategies to develop and sustain a high-reliability safety culture
3. Be able to evaluate governance, ethics and accountability in process safety	3.1 Critically evaluate governance structures supporting process safety management
	3.2 Analyse ethical principles in decision-making within high-hazard industries
	3.3 Evaluate accountability mechanisms for leadership and organisational performance

	3.4 Critically assess integration of governance and ethics in process safety strategy
4. Be able to evaluate stakeholder engagement and communication in process safety	4.1 Analyse the influence of internal and external stakeholders on process safety outcomes
	4.2 Critically evaluate stakeholder engagement strategies in high-risk environments
	4.3 Evaluate communication frameworks for process safety leadership and crisis situations
	4.4 Critically assess effectiveness of communication in driving organisational safety improvement
5. Be able to develop strategic approaches for organisational transformation in process safety	5.1 Critically evaluate change management models in process safety contexts
	5.2 Develop strategies for organisational transformation and process safety improvement
	5.3 Evaluate performance indicators and governance systems for continuous improvement
	5.4 Synthesise approaches to enhance organisational resilience and long-term safety performance

Indicative Content

1. Strategic Leadership in Process Safety

- Leadership theories (transformational, adaptive, high-reliability leadership)
- Leadership influence in major hazard industries
- Strategic decision-making in complex environments
- Role of leadership in MAH prevention

2. Process Safety Culture and Human Factors

- Safety culture maturity models (Hudson, HSE models)
- High Reliability Organisations (HRO principles)
- Human factors, behavioural safety, competence management
- Workforce engagement and safety ownership

3. Governance and Ethical Leadership

- Corporate governance frameworks in process safety
- Board-level accountability and oversight
- Ethical decision-making in high-risk industries
- Transparency, compliance, and regulatory expectations

4. Stakeholder Engagement and Communication

- Stakeholder mapping and influence
- Communication strategies in high-hazard environments
- Crisis communication and emergency leadership
- Organisational learning and knowledge sharing

5. Organisational Transformation and Continuous Improvement

- Change management models (Kotter, Lewin)
- Performance measurement (leading, lagging indicators)
- Process safety KPIs and governance systems
- Organisational resilience and adaptability

Recommended Texts & Resources

Books:

- CCPS – *Guidelines for Risk Based Process Safety*
- Hopkins, A. – *Lessons from Longford*
- Reason, J. – *Managing the Risks of Organizational Accidents*
- Cooper, D. – *Improving Safety Culture*

Standards & Frameworks:

- OSHA PSM (29 CFR 1910.119)
- COMAH / Seveso III Directive
- ISO 45001 (Leadership context)
- OECD Corporate Governance for Process Safety

Professional Resources:

- IOSH leadership and culture guidance
- BCSP professional practice frameworks
- IChemE Safety Centre publications

Process Safety Management Systems and Organisational Integration

Unit Name: Process Safety Management Systems and Organisational Integration
Unit Number: PSM802
Unit Level: 8
No.of credits: 20
Mandatory/ Optional: Mandatory

Unit Aim

The aim of this unit is to develop advanced knowledge and critical understanding of process safety management systems (PSMS) and their integration within organisational and operational frameworks. The unit enables learners to critically evaluate system components, governance structures, lifecycle approaches, and management of change processes, and to design integrated systems that ensure effective control of major accident hazards (MAH) and continuous organisational improvement.

Learning Outcomes, Assessment Criteria

Learning Outcomes (LO)- Will be able to	Assessment Criteria (AC)- Learner can:
1. Be able to critically evaluate process safety management systems (PSMS) and frameworks	1.1 Critically evaluate recognised PSMS frameworks (e.g., CCPS RBPS, OSHA PSM)
	1.2 Analyse the structure and interdependencies of PSMS elements across the asset lifecycle
	1.3 Evaluate the effectiveness of PSMS in controlling major accident hazards (MAH)
	1.4 Critically assess the role of organisational context in shaping PSMS implementation
2. Be able to analyse process safety information (PSI) and operational control systems	2.1 Critically evaluate requirements for process safety information (design data, operating limits, chemical hazards)
	2.2 Analyse safe operating envelopes and their role in process safety control
	2.3 Evaluate operational control systems including permit-to-work, isolation and procedural compliance
	2.4 Critically assess integration of PSI into digital and organisational systems
3. Be able to evaluate management of change (MoC) and lifecycle system integration	3.1 Critically evaluate management of change (MoC) processes in high-hazard industries
	3.2 Analyse lifecycle integration from design, operation, maintenance to decommissioning
	3.3 Evaluate the impact of technical and organisational changes on MAH risk
	3.4 Critically assess strategies to ensure safe and controlled implementation of change

4. Be able to evaluate assurance, auditing and performance measurement systems	4.1 Critically evaluate assurance systems including audits, reviews and self-verification
	4.2 Analyse leading, lagging and learning indicators in process safety performance measurement
	4.3 Evaluate the effectiveness of monitoring systems in ensuring compliance and improvement
	4.4 Critically assess data-driven approaches for continuous improvement in PSMS
5. Be able to design integrated process safety management systems for organisational effectiveness	5.1 Develop an integrated PSMS aligned with organisational strategy and risk profile
	5.2 Evaluate governance and accountability mechanisms within PSMS
	5.3 Synthesise approaches to integrate PSMS with business management systems
	5.4 Critically evaluate strategies to enhance organisational resilience and long-term process safety performance

Indicative Content

1. Process Safety Management Systems (PSMS) Frameworks

- Principles and architecture of Process Safety Management Systems
- CCPS Risk-Based Process Safety (RBPS) – 4 pillars and 20 elements
- OSHA PSM framework (14 elements) and comparison with RBPS
- Integration of PSMS with ISO management systems (ISO 45001, ISO 9001)
- System interdependencies and organisational alignment
- Role of governance and leadership in PSMS implementation

2. Process Safety Information (PSI) and Operational Controls

- Requirements for Process Safety Information (PSI): process design, chemical hazards, equipment data
- Safe operating limits and operating envelopes
- Development and control of operating procedures
- Permit-to-work systems, isolation procedures and control of work
- Integration of PSI into digital systems and documentation frameworks
- Data integrity, accuracy and accessibility in process safety systems

3. Management of Change (MoC) and Lifecycle Integration

- Principles and application of Management of Change (MoC)
- Types of change: technical, organisational, procedural and temporary changes

- Lifecycle approach: design, construction, operation, maintenance and decommissioning
- Impact of change on major accident hazard (MAH) risk
- Risk assessment within MoC processes
- Governance and approval workflows for change control

4. Assurance, Auditing and Performance Measurement

- Process safety assurance systems and verification frameworks
- Internal audits, external audits and independent reviews
- Leading, lagging and learning indicators (API RP 754)
- Performance measurement systems and KPIs
- Compliance monitoring and reporting mechanisms
- Continuous improvement through audit findings and feedback loops

5. System Integration and Organisational Effectiveness

- Integration of PSMS with business management systems
- Governance structures and accountability frameworks
- Organisational resilience and system reliability
- Digitalisation and system integration in process safety
- Data-driven decision-making and system optimisation
- Continuous improvement strategies and organisational learning

Recommended Texts & Resources

Core Books

- CCPS – *Guidelines for Risk Based Process Safety* (Wiley)
- CCPS – *Guidelines for Implementing Process Safety Management Systems*
- CCPS – *Guidelines for Process Safety Metrics*
- Kletz, T. – *What Went Wrong? Case Histories of Process Plant Disasters*
- Lees, F.P. – *Loss Prevention in the Process Industries*

Standards & Regulations

- OSHA 29 CFR 1910.119 – Process Safety Management of Highly Hazardous Chemicals
- EU Seveso III Directive (2012/18/EU) / COMAH Regulations
- ISO 45001 – Occupational Health and Safety Management Systems

- API RP 754 – Process Safety Performance Indicators

Guidance & Industry Resources

- UK HSE – *Managing for Health and Safety (HSG65)*
- UK HSE – *Developing Process Safety Indicators (HSG254)*
- CCPS – RBPS training materials
- IChemE Safety Centre – Process safety guidance and publications

Digitalisation & Systems

- CCPS – *Guidelines for Digitalisation in Process Safety*
- ISO/IEC 27001 – Information Security (for data governance)
- Industry publications on digital safety systems and integration

Advanced Process Hazard Analysis and Quantitative Risk Modelling

Unit Name: Advanced Process Hazard Analysis and Quantitative Risk Modelling
Unit Number: PSM803
Unit Level: 8
No.of credits: 20
Mandatory/ Optional: Mandatory

Unit Aim

The aim of this unit is to develop advanced knowledge and critical understanding of process hazard analysis and quantitative risk modelling techniques used in high-hazard industries. The unit enables learners to critically evaluate and apply qualitative, semi-quantitative, and quantitative methods to assess major accident hazards (MAH), model risk scenarios, and support strategic decision-making for risk reduction and regulatory compliance.

Learning Outcomes, Assessment Criteria

Learning Outcomes (LO)- Will be able to	Assessment Criteria (AC)- Learner can:
1. Be able to critically evaluate advanced hazard identification methodologies	1.1 Critically evaluate structured hazard identification techniques (HAZID, HAZOP, What-if analysis)
	1.2 Analyse the application of hazard studies across the asset lifecycle
	1.3 Critically assess limitations and uncertainties in hazard identification methods
	1.4 Evaluate the integration of human factors into hazard identification processes
2. Be able to evaluate and apply advanced risk assessment methodologies	2.1 Critically evaluate qualitative and semi-quantitative risk assessment methods (risk matrix, bowtie, LOPA)
	2.2 Apply quantitative risk assessment (QRA) techniques in high-hazard scenarios
	2.3 Analyse frequency and consequence modelling approaches in risk evaluation
	2.4 Critically assess uncertainty, assumptions and limitations in risk modelling
3. Be able to analyse and model major accident hazard scenarios	3.1 Apply fault tree analysis (FTA) and event tree analysis (ETA) to model accident scenarios
	3.2 Evaluate consequence modelling techniques (fire, explosion, toxic dispersion)
	3.3 Analyse escalation pathways and barrier failures in MAH scenarios
	3.4 Critically evaluate effectiveness of control measures and safeguards

4. Be able to evaluate regulatory and organisational requirements for risk management	4.1 Critically evaluate regulatory expectations for hazard analysis and risk assessment (COMAH, OSHA PSM)
	4.2 Analyse ALARP / SoFARP principles in risk decision-making
	4.3 Evaluate organisational responsibilities in demonstrating risk reduction
	4.4 Critically assess documentation and reporting requirements for regulatory compliance
5. Be able to synthesise risk modelling outputs for strategic decision-making	5.1 Integrate hazard and risk analysis outputs into organisational decision-making frameworks
	5.2 Evaluate the role of risk modelling in design, operation and emergency planning
	5.3 Synthesise risk-based strategies for major accident prevention
	5.4 Critically evaluate the role of digital tools and simulation models in risk analysis

Indicative Content

1. Hazard Identification Techniques

- Principles of hazard identification in process safety
- HAZID, HAZOP, What-if analysis, checklists
- Lifecycle application of hazard studies
- Human factors integration in hazard identification
- Limitations and uncertainties in hazard studies

2. Risk Assessment Methodologies

- Qualitative, semi-quantitative and quantitative risk assessment
- Risk matrices, bowtie analysis, LOPA
- Quantitative Risk Assessment (QRA) principles
- Frequency vs consequence modelling
- Risk tolerability and decision-making

3. Risk Modelling and Analysis

- Fault Tree Analysis (FTA)
- Event Tree Analysis (ETA)
- Barrier-based risk modelling
- Consequence modelling:
    - Fire and explosion modelling

    - Toxic gas dispersion modelling
- Escalation and domino effects

4. Regulatory and Risk Frameworks

- COMAH / Seveso III Directive
- OSHA PSM requirements
- ALARP / SoFARP principles
- Risk reporting and regulatory submissions
- Safety case and risk demonstration

5. Advanced Risk Decision-Making

- Risk-based decision frameworks
- Integration with design and operational systems
- Digital modelling tools and simulation software
- Data-driven risk analysis
- Continuous improvement in risk management

Recommended Texts & Resources

Core Technical Books

- CCPS – *Guidelines for Hazard Evaluation Procedures*
- CCPS – *Layer of Protection Analysis (LOPA)*
- CCPS – *Guidelines for Chemical Process Quantitative Risk Analysis*
- Lees, F.P. – *Loss Prevention in the Process Industries*
- Kletz, T. – *Hazop and Hazan*

Standards & Regulations

- OSHA 29 CFR 1910.119 – PSM
- EU Seveso III Directive / COMAH
- API RP 754 – Process Safety Indicators

Industry Guidance

- UK HSE – Hazard and Operability Studies Guide
- UK HSE – Risk Assessment and ALARP guidance
- IChemE Safety Centre publications

Safety Integrity, Reliability and Functional Safety Engineering

Unit Name: Safety Integrity, Reliability and Functional Safety Engineering
Unit Number: PSM804
Unit Level: 8
No.of credits: 20
Mandatory/ Optional: Mandatory

Unit Aim

The aim of this unit is to develop advanced knowledge and critical understanding of safety integrity, reliability engineering, and functional safety systems in high-hazard industries. The unit enables learners to critically evaluate Safety Instrumented Systems (SIS), Safety Integrity Levels (SIL), and reliability modelling techniques, and to design, validate, and optimise engineering systems that ensure effective risk reduction and compliance with international functional safety standards.

Learning Outcomes, Assessment Criteria

Learning Outcomes (LO)- Will be able to	Assessment Criteria (AC)- Learner can:
1. Be able to critically evaluate principles of functional safety and safety integrity systems	1.1 Critically evaluate the principles of functional safety and Safety Instrumented Systems (SIS)
	1.2 Analyse the concept and application of Safety Integrity Levels (SIL) in risk reduction
	1.3 Evaluate system architectures including sensors, logic solvers and final elements
	1.4 Critically assess redundancy, diversity and fail-safe design principles
2. Be able to evaluate reliability engineering and system performance	2.1 Critically evaluate reliability engineering concepts (failure rates, MTBF, PFDavg)
	2.2 Analyse system reliability using fault tree and event tree modelling
	2.3 Evaluate human factors influencing system reliability and performance
	2.4 Critically assess maintenance and proof testing strategies for system integrity
3. Be able to analyse functional safety lifecycle and regulatory requirements	3.1 Critically evaluate the functional safety lifecycle (IEC 61508 / IEC 61511)
	3.2 Analyse regulatory and industry requirements for functional safety compliance
	3.3 Evaluate separation and integration of SIS with control systems (BPCS)
	3.4 Critically assess documentation and validation requirements for compliance

4. Be able to design and validate safety integrity systems	4.1 Design Safety Instrumented Systems (SIS) for specified hazard scenarios
	4.2 Evaluate SIL determination methods (risk graph, LOPA, FTA)
	4.3 Critically assess system validation and verification processes
	4.4 Analyse performance of safety systems through audits and reviews
5. Be able to develop strategies to optimise safety and reliability systems	5.1 Critically evaluate system performance improvement strategies
	5.2 Synthesise approaches for lifecycle optimisation of safety systems
	5.3 Evaluate integration of digital technologies in system monitoring and control
	5.4 Critically assess strategies to enhance reliability and long-term system performance

Indicative Content

1. Functional Safety and SIS Fundamentals

- Principles of functional safety
- Safety Instrumented Systems (SIS) architecture
- Safety Integrity Levels (SIL) and risk reduction
- System components: sensors, logic solvers, final elements
- Fail-safe design, redundancy and diversity

2. Reliability Engineering

- Reliability concepts: failure rates, MTBF, PFDavg
- Reliability modelling techniques
- Fault Tree Analysis (FTA) and Event Tree Analysis (ETA)
- Human reliability and system interaction
- Maintenance strategies and proof testing

3. Functional Safety Lifecycle

- IEC 61508 and IEC 61511 lifecycle requirements
- Design, operation, maintenance and decommissioning
- Verification and validation processes
- Documentation and compliance requirements
- Integration with organisational safety systems

4. System Design and Performance Evaluation

- SIS design for hazard scenarios
- SIL determination methods (LOPA, risk graph, FTA)
- System validation and performance testing
- Audit and review processes
- Risk reduction effectiveness

5. Advanced System Optimisation

- Lifecycle optimisation of safety systems
- Digitalisation and real-time monitoring systems
- Integration with control systems (BPCS)
- Continuous improvement strategies
- Reliability enhancement techniques

Recommended Texts & Resources

Core Technical Books

- CCPS – *Guidelines for Safety Instrumented Systems*
- CCPS – *Guidelines for Safe Automation of Chemical Processes*
- Lees, F.P. – *Loss Prevention in the Process Industries*
- Goble, W.M. – *Control Systems Safety Evaluation and Reliability*

Standards

- IEC 61508 – Functional Safety Standard
- IEC 61511 – Process Industry SIS Standard
- OSHA PSM (29 CFR 1910.119)
- API standards on safety systems

Industry Guidance

- UK HSE – *Managing Competence for Safety-Related Systems (HSG250)*
- UK HSE – *Out of Control – Control Systems Failures (HSG238)*
- IChemE Safety Centre resources
- ISA functional safety guidance

Major Accident Prevention, Regulatory Strategy and Compliance

Unit Name: Major Accident Prevention, Regulatory Strategy and Compliance
Unit Number: PSM805
Unit Level: 8
No.of credits: 20
Mandatory/ Optional: Mandatory

Unit Aim

The aim of this unit is to develop advanced knowledge and critical understanding of major accident prevention strategies, regulatory frameworks, and compliance systems in high-hazard industries. The unit enables learners to critically evaluate international regulatory regimes, assess organisational responsibilities for managing major accident hazards (MAH), and design strategic approaches to ensure compliance, risk reduction, and continuous improvement in process safety performance.

Learning Outcomes, Assessment Criteria

Learning Outcomes (LO)- Will be able to	Assessment Criteria (AC)- Learner can:
1. Be able to critically evaluate major accident hazard (MAH) prevention strategies	1.1 Critically evaluate the concept of major accident hazards (fires, explosions, toxic releases)
	1.2 Analyse causes and consequences of major industrial accidents
	1.3 Evaluate prevention strategies and control measures for MAH risk reduction
	1.4 Critically assess effectiveness of barrier-based approaches in accident prevention
2. Be able to evaluate international regulatory frameworks in process safety	2.1 Critically evaluate major regulatory regimes (COMAH/Seveso, OSHA PSM)
	2.2 Analyse differences in regulatory approaches across jurisdictions
	2.3 Evaluate the role of regulatory authorities in enforcement and compliance
	2.4 Critically assess challenges in global regulatory harmonisation
3. Be able to analyse organisational responsibilities for compliance and risk management	3.1 Analyse organisational duties in preparing safety reports and risk assessments
	3.2 Evaluate requirements for demonstrating ALARP / SoFARP
	3.3 Critically assess accountability mechanisms for regulatory compliance
	3.4 Evaluate consequences of non-compliance (legal, financial, reputational)

4. Be able to evaluate compliance systems, auditing and assurance frameworks	4.1 Critically evaluate compliance management systems and policies
	4.2 Analyse audit methodologies (internal, external, regulatory inspections)
	4.3 Evaluate inspection readiness and evidence-based compliance
	4.4 Critically assess role of independent verification and assurance systems
5. Be able to develop strategic approaches for regulatory compliance and improvement	5.1 Develop regulatory compliance strategies aligned with organisational objectives
	5.2 Evaluate integration of compliance with process safety management systems
	5.3 Synthesise approaches for continuous improvement in regulatory performance
	5.4 Critically assess the role of governance and leadership in sustaining compliance

Indicative Content

1. Major Accident Hazard (MAH) Prevention

- Definition and characteristics of MAH (fires, explosions, toxic releases)
- Case studies: Bhopal, Piper Alpha, Texas City, Buncefield
- Barrier-based safety systems and risk reduction
- Layers of protection and escalation prevention
- Major accident prevention strategies

2. Regulatory Frameworks

- COMAH / Seveso III Directive
- OSHA PSM (29 CFR 1910.119)
- Comparison of international regulatory regimes
- Role of regulators and enforcement bodies
- Global compliance challenges

3. Compliance and Risk Demonstration

- ALARP / SoFARP principles
- Safety case approach and risk demonstration
- Regulatory submissions and safety reports
- Organisational accountability and legal duties

- Consequences of regulatory failure

4. Auditing and Assurance Systems

- Compliance audits and inspection frameworks
- Internal and external audits
- Regulatory inspections and enforcement actions
- Evidence-based compliance and documentation
- Continuous improvement through audit findings

5. Strategic Compliance and Governance

- Integration of compliance into PSMS
- Governance frameworks and accountability
- Risk-based compliance strategies
- Performance monitoring and improvement
- Leadership role in regulatory compliance

Recommended Texts & Resources

Core Books

- CCPS – *Guidelines for Risk Based Process Safety*
- CCPS – *Guidelines for Implementing Process Safety Management*
- Lees, F.P. – *Loss Prevention in the Process Industries*
- Kletz, T. – *What Went Wrong?*

Standards & Regulations

- OSHA 29 CFR 1910.119 – Process Safety Management
- EU Seveso III Directive (2012/18/EU)
- COMAH Regulations (UK)
- API RP 754 – Process Safety Indicators

Industry Guidance

- UK HSE – *Managing for Health and Safety (HSG65)*
- UK HSE – *Developing Process Safety Indicators (HSG254)*
- OECD – *Corporate Governance for Process Safety*
- IChemE Safety Centre publications

Applied Research Project in Process Safety Management

Unit Name: Applied Research Project in Process Safety Management
Unit Number: PSM806
Unit Level: 8
No.of credits: 40
Mandatory/ Optional: Mandatory

Unit Aim

The aim of this unit is to develop learners' ability to undertake independent, advanced research in process safety management. The unit enables learners to critically investigate complex process safety challenges, apply appropriate research methodologies, synthesise theoretical and practical knowledge, and produce original research that contributes to professional practice and organisational improvement in high-hazard industries.

Learning Outcomes, Assessment Criteria

Learning Outcomes (LO)- Will be able to	Assessment Criteria (AC)- Learner can:
1. Be able to design an independent research project in process safety management	1.1 Critically evaluate research problems and formulate clear research objectives
	1.2 Develop a research proposal addressing a complex process safety issue
	1.3 Critically evaluate appropriate research methodologies and methods
	1.4 Justify the research design in relation to process safety challenges
2. Be able to critically review literature and theoretical frameworks	2.1 Critically analyse existing literature related to process safety management
	2.2 Evaluate theoretical and practical frameworks relevant to the research topic
	2.3 Identify knowledge gaps and research opportunities
	2.4 Synthesise literature to support research direction
3. Be able to apply research methods and analyse data	3.1 Apply appropriate qualitative and/or quantitative research methods
	3.2 Critically evaluate data collection techniques and reliability
	3.3 Analyse and interpret research data using appropriate tools
	3.4 Critically assess limitations and validity of findings

4. Be able to evaluate research findings and develop conclusions	4.1 Critically evaluate research findings in relation to objectives
	4.2 Analyse implications of findings for process safety practice
	4.3 Develop evidence-based conclusions and recommendations
	4.4 Critically assess impact of research on organisational performance
5. Be able to present and communicate research outcomes effectively	5.1 Produce a structured research report with academic and professional standards
	5.2 Present findings using appropriate communication techniques
	5.3 Critically evaluate the effectiveness of communication strategies
	5.4 Demonstrate ethical and professional standards in research practice

Indicative Content

1. Research Design and Planning

- Research problem identification in process safety
- Development of research aims, objectives and questions
- Research proposal structure and approval
- Ethical considerations in research
- Research planning and project management

2. Literature Review and Theoretical Frameworks

- Academic and industry literature review techniques
- Critical evaluation of sources
- Process safety frameworks (CCPS, OSHA, ISO)
- Identification of research gaps
- Development of conceptual frameworks

3. Research Methodology and Methods

- Qualitative and quantitative research approaches
- Case study, survey, experimental and modelling approaches
- Data collection techniques (interviews, datasets, simulations)
- Data reliability, validity and bias
- Use of digital tools and analytics

4. Data Analysis and Interpretation

- Statistical and analytical techniques
- Risk modelling and data interpretation
- Evaluation of findings
- Linking theory with practice
- Limitations and uncertainty analysis

5. Research Outcomes and Professional Application

- Development of recommendations for industry practice
- Strategic implications for process safety management
- Communication of research findings
- Report writing and presentation
- Reflection and continuous professional development

Recommended Texts & Resources

Research Methodology

- Saunders, M. – *Research Methods for Business Students*
- Creswell, J. – *Research Design: Qualitative, Quantitative and Mixed Methods*
- Bryman, A. – *Social Research Methods*

Process Safety References

- CCPS – *Guidelines for Risk Based Process Safety*
- Lees, F.P. – *Loss Prevention in the Process Industries*
- IChemE Safety Centre publications

Standards & Guidance

- OSHA PSM (29 CFR 1910.119)
- ISO 45001
- UK HSE process safety publications

Academic & Digital Resources

- Google Scholar, ScienceDirect, ResearchGate
- Industry case studies and safety reports
- Process safety journals and publications

Digital Transformation, AI and Predictive Process Safety

Unit Name: Digital Transformation, AI and Predictive Process Safety
Unit Number: PSM807
Unit Level: 8
No.of credits: 20
Mandatory/ Optional: Optional

Unit Aim

The aim of this unit is to develop advanced knowledge and critical understanding of digital transformation, artificial intelligence (AI), and data-driven approaches in process safety management. The unit enables learners to critically evaluate emerging technologies, apply predictive analytics, and design digital strategies to enhance risk identification, monitoring, and decision-making in high-hazard industries.

Learning Outcomes, Assessment Criteria

Learning Outcomes (LO)- Will be able to	Assessment Criteria (AC)- Learner can:
1. Be able to critically evaluate digital transformation in process safety management	1.1 Critically evaluate the role of digital transformation in high-hazard industries
	1.2 Analyse integration of digital technologies within process safety systems
	1.3 Evaluate benefits and limitations of digitalisation in risk management
	1.4 Critically assess organisational readiness for digital transformation
2. Be able to analyse artificial intelligence and data analytics in process safety	2.1 Critically evaluate AI applications in hazard identification and risk assessment
	2.2 Analyse use of big data and analytics in process safety performance monitoring
	2.3 Evaluate machine learning models for predictive risk assessment
	2.4 Critically assess limitations, bias and reliability of AI systems
3. Be able to evaluate predictive and real-time monitoring systems	3.1 Analyse predictive maintenance and condition monitoring systems
	3.2 Evaluate real-time safety monitoring technologies (IoT, sensors)
	3.3 Critically assess early warning systems and anomaly detection

	3.4 Evaluate effectiveness of digital systems in preventing major accident hazards (MAH)
4. Be able to evaluate digital risk management and cybersecurity considerations	4.1 Critically evaluate digital risks and cybersecurity threats in process industries
	4.2 Analyse impact of cyber incidents on process safety systems
	4.3 Evaluate strategies for securing digital safety systems
	4.4 Critically assess governance and compliance in digital risk management
5. Be able to develop digital strategies for process safety improvement	5.1 Develop digital transformation strategies aligned with process safety objectives
	5.2 Evaluate integration of AI and digital tools into PSMS frameworks
	5.3 Synthesise approaches for data-driven decision-making
	5.4 Critically assess long-term impact of digitalisation on organisational safety performance

Indicative Content

1. Digital Transformation in Process Safety

- Digitalisation of process safety systems
- Industry 4.0 and smart manufacturing
- Integration of digital tools into PSMS
- Organisational readiness and change management
- Benefits and challenges of digital transformation

2. Artificial Intelligence and Data Analytics

- AI and machine learning fundamentals
- Applications in hazard identification and risk assessment
- Big data analytics in safety performance monitoring
- Predictive analytics and modelling
- Limitations and ethical considerations of AI

3. Predictive and Real-Time Monitoring Systems

- Predictive maintenance systems
- IoT-based safety monitoring
- Real-time data acquisition and analysis

- Early warning systems and anomaly detection
- Integration with control and safety systems

4. Cybersecurity and Digital Risk Management

- Cybersecurity risks in industrial systems
- Impact of cyber threats on process safety
- Protection of safety-critical systems
- Regulatory and governance frameworks
- Risk mitigation strategies

5. Digital Strategy and Future Trends

- Development of digital strategies for safety improvement
- Integration of AI into organisational decision-making
- Data-driven safety culture
- Future trends in digital process safety
- Continuous improvement and innovation

Recommended Texts & Resources

Core References

- CCPS – *Guidelines for Digitalisation in Process Safety*
- CCPS – *Guidelines for Risk Based Process Safety*
- Lees, F.P. – *Loss Prevention in the Process Industries*

Digital & AI Resources

- Russell & Norvig – *Artificial Intelligence: A Modern Approach*
- Provost & Fawcett – *Data Science for Business*
- Industry publications on AI in process safety

Standards & Guidance

- ISO/IEC 27001 – Information Security Management
- NIST Cybersecurity Framework
- IEC standards for industrial control systems security

Industry Sources

- IChemE Safety Centre publications

- AIChE / CCPS digital safety resources
- UK HSE digitalisation guidance

Emergency, Crisis Management and Organisational Resilience

Unit Name: Emergency, Crisis Management and Organisational Resilience
Unit Number: PSM808
Unit Level: 8
No.of credits: 20
Mandatory/ Optional: Optional

Unit Aim

The aim of this unit is to develop advanced knowledge and critical understanding of emergency preparedness, crisis management, and organisational resilience in high-hazard industries. The unit enables learners to critically evaluate emergency response systems, design crisis management strategies, and develop resilient organisational frameworks to effectively manage and recover from major accident events.

Learning Outcomes, Assessment Criteria

Learning Outcomes (LO)- Will be able to	Assessment Criteria (AC)- Learner can:
1. Be able to critically evaluate emergency preparedness systems	1.1 Critically evaluate emergency preparedness frameworks in high-hazard industries
	1.2 Analyse organisational emergency planning processes
	1.3 Evaluate adequacy of resources, training and response capabilities
	1.4 Critically assess integration of emergency preparedness within PSMS
2. Be able to analyse crisis management strategies and decision-making	2.1 Critically evaluate crisis management models and frameworks
	2.2 Analyse decision-making processes under uncertainty and time pressure
	2.3 Evaluate leadership roles in crisis situations
	2.4 Critically assess effectiveness of crisis communication strategies
3. Be able to evaluate emergency response and incident escalation	3.1 Analyse emergency response systems for major accident hazards (MAH)
	3.2 Evaluate escalation scenarios and domino effects
	3.3 Critically assess coordination between internal and external emergency services
	3.4 Evaluate effectiveness of response strategies in mitigating consequences

4. Be able to evaluate organisational resilience and recovery strategies	4.1 Critically evaluate organisational resilience frameworks
	4.2 Analyse business continuity and disaster recovery planning
	4.3 Evaluate organisational learning from crisis events
	4.4 Critically assess recovery strategies and long-term resilience building
5. Be able to develop strategic approaches for emergency and resilience management	5.1 Develop integrated emergency and crisis management strategies
	5.2 Evaluate alignment with regulatory and organisational requirements
	5.3 Synthesise approaches to improve resilience and adaptability
	5.4 Critically assess continuous improvement strategies in emergency management

Indicative Content

1. Emergency Preparedness Systems

- Emergency planning frameworks
- Risk-based emergency preparedness
- Resource allocation and training
- Integration with process safety systems
- Testing and validation of emergency plans

2. Crisis Management and Decision-Making

- Crisis management models and frameworks
- Decision-making under uncertainty
- Leadership roles during crisis
- Crisis communication strategies
- Stakeholder coordination

3. Emergency Response Systems

- Response strategies for MAH events
- Fire, explosion and toxic release scenarios
- Escalation and domino effects
- Coordination with external agencies (fire, medical, regulatory)

- Incident command systems

4. Organisational Resilience and Recovery

- Resilience frameworks and models
- Business continuity planning (BCP)
- Disaster recovery strategies
- Post-incident review and organisational learning
- Adaptability and system recovery

5. Strategic Emergency Management

- Integration of emergency management with PSMS
- Governance and accountability
- Regulatory compliance requirements
- Continuous improvement strategies
- Future trends in resilience management

RECOMMENDED TEXTS & RESOURCES

Core References

- CCPS – *Guidelines for Emergency Planning and Response*
- CCPS – *Guidelines for Risk Based Process Safety*
- Lees, F.P. – *Loss Prevention in the Process Industries*

Standards & Guidance

- ISO 22301 – Business Continuity Management
- OSHA PSM (Emergency Planning section)
- COMAH / Seveso III emergency requirements

Industry Guidance

- UK HSE – Emergency planning guidance
- FEMA – Crisis and emergency management frameworks
- IChemE Safety Centre publications

Incident Intelligence, Investigation and Organisational Learning

Unit Name: Incident Intelligence, Investigation and Organisational Learning
Unit Number: PSM809
Unit Level: 8
No.of credits: 20
Mandatory/ Optional: Optional

Unit Aim

The aim of this unit is to develop advanced knowledge and critical understanding of incident investigation, intelligence systems, and organisational learning in process safety management. The unit enables learners to critically evaluate investigation methodologies, analyse complex incident data, and design learning systems that enhance prevention strategies and organisational performance in high-hazard industries.

Learning Outcomes, Assessment Criteria

Learning Outcomes (LO)- Will be able to	Assessment Criteria (AC)- Learner can:
1. Be able to critically evaluate incident investigation methodologies	1.1 Critically evaluate structured investigation techniques (e.g., Root Cause Analysis, TapRooT, Tripod Beta)
	1.2 Analyse strengths and limitations of different investigation models
	1.3 Evaluate application of human factors in incident investigation
	1.4 Critically assess integration of investigation findings into safety systems
2. Be able to analyse causes and consequences of major incidents	2.1 Critically analyse causal factors of major accident events
	2.2 Evaluate immediate, underlying and root causes of incidents
	2.3 Analyse consequences and escalation pathways
	2.4 Critically assess system failures and barrier breakdowns
3. Be able to evaluate data-driven incident intelligence systems	3.1 Critically evaluate incident reporting and data collection systems
	3.2 Analyse use of data analytics in identifying trends and patterns
	3.3 Evaluate predictive approaches to incident prevention
	3.4 Critically assess reliability and limitations of incident data systems

4. Be able to evaluate organisational learning and knowledge management	4.1 Critically evaluate organisational learning models (single-loop, double-loop learning)
	4.2 Analyse knowledge management systems in process safety
	4.3 Evaluate learning from internal and external incident data
	4.4 Critically assess barriers to effective organisational learning
5. Be able to develop strategies for continuous improvement through incident learning	5.1 Develop strategies to integrate incident learning into PSMS
	5.2 Evaluate effectiveness of corrective and preventive actions
	5.3 Synthesise approaches to enhance organisational learning culture
	5.4 Critically assess long-term impact of learning systems on safety performance

Indicative Content

1. Incident Investigation Methodologies

- Root Cause Analysis (RCA)
- TapRooT, Tripod Beta, ICAM models
- Human factors in incident investigation
- Investigation processes and reporting
- Limitations and bias in investigations

2. Incident Analysis and Causation

- Immediate, underlying and root causes
- Barrier failure and system breakdown
- Accident causation models (Swiss cheese model)
- Escalation and domino effects
- Learning from major accident case studies

3. Incident Intelligence and Data Systems

- Incident reporting systems
- Data collection and analysis
- Trend analysis and pattern recognition
- Predictive analytics in incident prevention

- Digital incident management systems

4. Organisational Learning and Knowledge Management

- Learning organisations and safety culture
- Knowledge sharing and retention
- Lessons learned systems
- Internal vs external learning sources
- Continuous improvement frameworks

5. Continuous Improvement Strategies

- Corrective and preventive actions (CAPA)
- Integration with PSMS
- Feedback loops and improvement cycles
- Performance measurement
- Long-term safety improvement strategies

Recommended Texts & Resources

Core References

- CCPS – *Guidelines for Investigating Chemical Process Incidents*
- CCPS – *Guidelines for Risk Based Process Safety*
- Reason, J. – *Managing the Risks of Organizational Accidents*
- Kletz, T. – *What Went Wrong?*

Standards & Guidance

- OSHA PSM – Incident Investigation requirements
- ISO 45001 – Incident and non-conformity management
- UK HSE – Incident investigation guidance

Industry Resources

- IChemE Safety Centre publications
- AIChE / CCPS learning materials
- Industry accident case study databases

Asset Integrity and Reliability Management in High-Hazard Industries

Unit Name: Asset Integrity and Reliability Management in High-Hazard Industries
Unit Number: PSM810
Unit Level: 8
No.of credits: 20
Mandatory/ Optional: Optional

Unit Aim

The aim of this unit is to develop advanced knowledge and critical understanding of asset integrity, reliability management, and system performance in high-hazard industries. The unit enables learners to critically evaluate engineering systems, analyse failure mechanisms, and design strategies to ensure equipment integrity, reliability, and long-term process safety performance.

Learning Outcomes, Assessment Criteria

Learning Outcomes (LO)- Will be able to	Assessment Criteria (AC)- Learner can
1. Be able to critically evaluate asset integrity management systems	1.1 Critically evaluate principles of asset integrity management in high-hazard industries
	1.2 Analyse lifecycle management of equipment (design, operation, maintenance, decommissioning)
	1.3 Evaluate integrity management frameworks and standards
	1.4 Critically assess integration of asset integrity within PSMS
2. Be able to analyse failure mechanisms and reliability engineering principles	2.1 Critically analyse common failure mechanisms (corrosion, fatigue, erosion, human error)
	2.2 Evaluate reliability engineering concepts (MTBF, failure rates, reliability models)
	2.3 Analyse system failures using engineering tools and techniques
	2.4 Critically assess impact of failures on process safety performance
3. Be able to evaluate inspection, maintenance and monitoring strategies	3.1 Critically evaluate inspection strategies (risk-based inspection – RBI)
	3.2 Analyse preventive and predictive maintenance techniques
	3.3 Evaluate condition monitoring and real-time integrity systems
	3.4 Critically assess effectiveness of maintenance strategies in preventing MAH

4. Be able to evaluate standards, compliance and assurance systems for asset integrity	4.1 Critically evaluate regulatory and industry standards for asset integrity (API, ISO)
	4.2 Analyse compliance requirements for equipment safety and reliability
	4.3 Evaluate assurance systems including audits and verification
	4.4 Critically assess consequences of asset integrity failure
5. Be able to develop strategies to optimise asset integrity and reliability systems	5.1 Develop strategies for lifecycle optimisation of assets
	5.2 Evaluate integration of asset integrity with process safety management systems
	5.3 Synthesise approaches for improving reliability and performance
	5.4 Critically assess long-term asset management strategies and organisational impact

Indicative Content

1. Asset Integrity Management Systems

- Principles of asset integrity management
- Lifecycle approach: design, operation, maintenance, decommissioning
- Integration with process safety systems
- Asset integrity frameworks and governance

2. Failure Mechanisms and Reliability Engineering

- Corrosion, fatigue, erosion, material degradation
- Human and organisational factors in failure
- Reliability engineering principles (MTBF, failure rates)
- Failure analysis techniques

3. Inspection and Maintenance Strategies

- Risk-Based Inspection (RBI)
- Preventive and predictive maintenance
- Condition monitoring systems
- Digital monitoring and real-time systems

4. Standards and Compliance

- API standards (API 580, 581 – RBI)

- ISO standards for asset management
- Regulatory compliance requirements
- Assurance and verification systems

5. Optimisation and Continuous Improvement

- Lifecycle optimisation strategies
- Data-driven maintenance decisions
- Integration with PSMS
- Continuous improvement and performance enhancement

Recommended Texts & Resources

Core References

- CCPS – *Guidelines for Mechanical Integrity Systems*
- CCPS – *Guidelines for Risk Based Process Safety*
- Lees, F.P. – *Loss Prevention in the Process Industries*

Standards

- API 580 / 581 – Risk-Based Inspection
- ISO 55000 – Asset Management
- OSHA PSM – Mechanical Integrity

Industry Guidance

- UK HSE – Asset integrity guidance
- IChemE Safety Centre publications
- Industry maintenance and reliability frameworks