



Programme Specification

A statement of the knowledge, understanding and skills that underpin a taught programme of study leading to an award from The University of Sheffield

1	Programme Title	Process Safety and Loss Prevention
2	Programme Code	CPET03 (Full-time), CPET04 (Part-time)
3	JACS Code	H120
4	Level of Study	Postgraduate
5a	Final Qualification	Master of Science in Engineering (MSc (Eng))
5b	QAA FHEQ Level	Masters - 7
6	Intermediate Qualifications	Postgraduate Certificate (PGCert), Postgraduate Diploma (PGDip)
6b	FHEQ Level	Masters - 7
7	Teaching Institution (if not Sheffield)	Not applicable
8	Faculty	Engineering
9	Department	Chemical and Biological Engineering
10	Other Department involved in teaching the programme	Not applicable
11	Modes of Attendance	Full-time or Part-time
12	Duration of the Programme	1 year or 2 years
13	Accrediting Professional or Statutory Body	Institution of Chemical Engineers
14	Date of production/revision	April 2022

15. Background to the programme and subject area

The impact of major accidents on businesses within the chemical and energy sectors has emphasised that safe operation is business critical. This has driven the demand for specialists in the field of process safety. The requirements placed on plant operators at all stages from design to decommissioning have produced their own specialist sector, in the form of in-house process safety departments and an expanding consultancy company market. This has generated a strong market demand and graduates will normally have agreed positions before completion of the programme. Part of this demand also arises from the third world development in safety culture, driven in part by global companies seeking to apply consistent standards across all of their operations.

The MSc in Process Safety and Loss Prevention programme provides students with the necessary range of knowledge and skills to enable them to take a leading role in the decisions which will lead to the design and operation of a safe plant. The type of work for which the training provides the necessary skills are as follows:

- Safety assessment of process plant across a range of industries covering the full lifecycle;
- Improving operational performance through increased reliability and availability of equipment;
- Establishment of process safety management systems and monitoring their performance;
- Development of safety cases to provide in-house assurance and to meet external regulatory requirements;
- Evaluation of the social, environmental and business impact of major accidents;
- Enhancing the safety infrastructure in developing countries.

16. Programme aims

The University's Mission is to provide students from a wide variety of educational and social backgrounds with high-quality education in a research-led environment using staff working at the frontiers of academic enquiry. The Department of Chemical and Biological Engineering implements this through its strong commitment to both teaching and research. It also aims to engender in its students a commitment to future self-learning and social responsibility.

The specific aims of the programme are to:

1. Provide access to an engineering degree to students from a range of academic and social backgrounds;
2. Prepare students for a professional career in industry, education, public and commercial sectors;
3. Develop interpersonal skills appropriate to a professional person;
4. Encourage students to think for themselves, work effectively on their own initiative, and develop a social awareness;
5. Provide experience in conducting extended individual projects;
6. Develop the students' ability to make technical decisions;
7. Provide students with an education through a firm understanding and practical knowledge in process safety and loss prevention;
8. Provide students with an understanding of modern process management systems;
9. Provide students with the tools and techniques to identify and assess the risks from major accidents;
10. Provide students with the skills and knowledge to incorporate safety into design and operations;
11. Provide students with a working knowledge of how process safety concepts are applied within specific industrial sectors.

17. Programme learning outcomes

Knowledge and understanding:-	
Students will have developed knowledge and understanding of:	
K1	Appropriate mathematical methods, principles of IT and communications relevant to process safety.
K2	Science appropriate to the discipline of process safety management.
K3	Organising for process safety (Plan Do Check Act). Structure and elements of a modern Process Safety Management System. Monitoring, auditing and reviewing process safety performance. Learning from accidents. Leadership and organisational culture. Safety legislative frameworks.
K4	Hazard identification and risk quantification methodologies, basis for risk criteria, hazard and risk assessment through the project lifecycle, bow tie analysis, demonstration of ALARP (as low as reasonably practicable).
K5	Detailed application of the HAZOP (Hazard and Operability) technique to identify potential hazards.
K6	Techniques and application of reliability availability and maintainability assessment. Failure Modes and Effect Analysis.
K7	Use of design codes and standards. Plant siting and layout. Design of safety systems. Inherently Safer Design. Performance standards for safety critical elements. Process safety in operations including development and use of procedures, management of change and control of work.
K8	Hazardous area classification, prevention of flammable atmosphere, control of ignition sources.
K9	Predicting the effects of fires, explosions and toxic releases on populations, structures and the environment and the development and deployment of emergency response plans.
K10	The role of human factors in safe system design and operation (errors and violations, ergonomics and design, quantification of error rates, staffing and fatigue, communication).
K11	Assessing the hazards and risks from process control system failures. Testing and validation of systems including software. Development of fault tolerant systems. Standards for safety critical control systems. Layers of Protection Analysis and assessment of Safety Integrity Levels.

K12	Application of process safety techniques in the context of specific industries.
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Skills and other attributes:-

Intellectual Skills – students will be able to:
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I1	Understand the specific hazards associated with potentially hazardous materials and their usage.
I2	Identify potential sources of major accident events using a range of techniques.
I3	Design systems to eliminate, prevent, control and mitigate potential major accidents.
I4	Understand the systems and techniques for achieving safe and reliable operations.
I5	Identify, quantify and manage the risk of major accidents.
I6	Understand and assess the impact of human factors in design and operation.
I7	Understand how a process safety management is operated and its essential elements.
I8	Apply process safety skills to issues across a range of industries.

Practical Skills – students will be able to:

P1	Make use of appropriate mathematical methods for modelling and analysing discipline specific chemical engineering problems.
P2	Make use of safety engineering IT tools.
P3	Undertake the design of a system, component or process.
P4	Research for information to develop ideas further.
P5	Apply engineering techniques taking account of industrial and commercial constraints.
P6	Progress a larger scale study project by assembling the necessary knowledge and making safety judgements.

General Transferable Skills – students will be able to:
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T1	Undertake manipulation, sorting and presentation of data.
T2	Make use of scientific evidence based methods in the solution of problems.
T3	Make use of general IT tools.
T4	Make use of creativity and innovation in problem solving.
T5	Work with limited or contradictory information.
T6	Effective written communication and approach to the solution of problems in an engineering environment.
T7	Time and resource management.
T8	Teamwork and leadership.

18. Teaching, learning and assessment

Development of the learning outcomes is promoted through the following teaching and learning methods:

The main teaching, learning and assessment methods adopted for each learning outcome are shown below. In most cases a combination of methods is used. Lectures are the principal means of imparting knowledge, and understanding is gained through a combination of workshops/tutorials/example classes, and coursework assignments.

Teaching is carried out via block delivery during intensive weeks in order to meet the needs of both full-time students and part time students who are in concurrent full time employment. Module dates are communicated to students in advance to allow them to plan accordingly.

The programme also provides a number of opportunities for personal development, including the interaction with those working in the field, during lectures and workshop sessions, and by encouraging responsibility in the decision making process, often when confronting complex industrial plant scenarios.

Opportunities to demonstrate achievement of the learning outcomes are provided through the following assessment methods:

Knowledge and understanding are primarily assessed in written assignments. Skills are acquired mainly through coursework. Additional skills are acquired by means of an individual project undertaken as an industrial placement and this forms a major part of the overall assessment.

LEARNING OUTCOME (abbreviated - see Section 17 for full text)	Teaching/Learning				Assessment		
	Lectures	Coursework assignments	Tutorials /example classes	Individual investigative project for the MSc programme	Written examinations	Coursework submissions	Individual Design project for the MSc programme
K1 Mathematical methods
K2 Process safety science
K3 Process safety management
K4 Hazard identification and risk assessment
K5 HAZOP
K6 Engineering reliability
K7 Process safety in design and operations
K8 Hazardous area classification
K9 Consequence modelling and emergency response
K10 Human Factors
K11 Control Systems
K12 Industry Specific
I1 Mathematical methods
I2 Hazards
I3 Hazard mitigation
I4 Failure avoidance systems
I5 Safe design and hazard mitigation
I6 Human error minimisation
I7 Effects of hazards
I8 Management structure
P1 Mathematical methods
P2 IT tools
P3 Design
P4 Research
P5 Industrial application

P6 Large scale study				.				.
T1 Data manipulation	.	.	.	.			.	.
T2 Problem solving		.	.	.			.	.
T3 IT tools		.		.			.	.
T4 Creativity and innovation	.	.		.			.	.
T5 Contradictory information		.		.			.	.
T6 Effective communication		.		.			.	.
T7 Time and resource	.	.		.			.	.
T8 Teamwork and leadership				.				.

19. Reference points

The learning outcomes have been developed to reflect the following points of reference:

Subject Benchmark Statements

<https://www.qaa.ac.uk/quality-code/subject-benchmark-statements>

Framework for Higher Education Qualifications (2014)

<https://www.qaa.ac.uk/docs/qaa/quality-code/qualifications-frameworks.pdf>

University Vision

<https://www.sheffield.ac.uk/vision>

Learning and Teaching Strategy (2016-21)

https://www.sheffield.ac.uk/polopoly_fs/1.661828!/file/FinalStrategy.pdf

‘Accreditation of Chemical Engineering Programmes based on Learning Outcomes’, Institution of Chemical Engineers, September 2015.

‘Academic Standards – Engineering’, Subject Benchmark Statement, Quality Assurance Agency for Higher Education, 2015.

In assessing students’ achievement of the learning outcomes, the level of performance, e.g. the extent of knowledge and depth of understanding, will be compliant with guidance given in the above references.

20. Programme structure and regulations

Students are required to complete eight compulsory 15-credit taught modules to the value of 120 credits, as well as a 60 credit compulsory project module (CPE6390). Modules are assessed by assignment and by a dissertation for CPE6390. The objective of the project is to allow the students to demonstrate the practical application of a number of skills acquired on the programme in an industrial context.

The overall workload for full-time and part-time students following the MSc programme is the same. Full-time students should complete all of the work elements in one year and part-time students are required to complete all of the modules and assignments within two years with not fewer than four modules completed within the first year. Part-time students are allowed to take a third year for the completion of their project and dissertation submission. Students registering for the Diploma do not undertake a project. Students registering for the Certificate are required to pass 60 credits of taught modules.

Information concerning individual modules can be found online at

<https://www.sheffield.ac.uk/cbe/postgraduate/taught-courses>.

Detailed information about the structure of programmes, regulations concerning assessment and progression and descriptions of individual modules are published in the University Calendar available on-line at

<http://www.sheffield.ac.uk/calendar>.

21. Student development over the course of study

Assignments set for the programme are intended to allow the student to demonstrate the required level of knowledge for a particular element of taught work. The pass level for assessed work is set by the University, and award of the final MSc degree or PG Diploma is based on the University rules regarding credits obtained during the programme.

22. Criteria for admission to the programme

The programme is vocational in nature and provides the basis for a fundamental approach to the understanding and management of safety related issues in the chemical industry. Entry to the programme is based on successful completion of a first degree in a suitable science or engineering subject.

Detailed information regarding admission to the programme is available at <http://www.sheffield.ac.uk/postgraduate/taught>.

23. Additional information

Further information is available in the MSc Process Safety and Loss Prevention programme brochure from the Department of Chemical and Biological Engineering or online at <http://www.shef.ac.uk/cbe/pg>.

This specification represents a concise statement about the main features of the programme and should be considered alongside other sources of information provided by the teaching department(s) and the University. In addition to programme specific information, further information about studying at the University of Sheffield can be accessed via our Student Services web site at www.shef.ac.uk/ssid.