

Module Details	
Module Title:	Reliability and Safety Engineering
Module Code:	ENB6009-B
Academic Year:	2019-20
Credit Rating:	20
School:	Department of Chemical Engineering
Subject Area:	Engineering Business
FHEQ Level:	FHEQ Level 6
Pre-requisites:	
Co-requisites:	

Contact Hours	
Type	Hours
Lectures	24
Tutorials	24
Directed Study	152

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Academic Year (Sept - May)

Module Aims
The students will be able to develop a detailed knowledge of the theories, principles and practices of reliability and safety engineering and apply these principles in the design, operation and maintenance of complex systems.

Outline Syllabus
Reliability Engineering: Fundamental concepts of reliability engineering. Basic definitions. Bathtub hazard rate curve. Constant failure and repair rate models. Reliability block diagrams. Steady state and transient availability. Reliability data banks (electrical, electronic, mechanical, communication and oil). Use of life distributions (Weibull, Normal, Lognormal) and discrete distributions (Poisson, Binomial) in risk and reliability. Estimation of reliability parameters using

graphical methods. Fault Tree Analysis (FTA): construction, qualitative and quantitative analyses. Common cause analysis. Notions of Markov modeling and Monte Carlo Simulation. Relevant BS and Mil. Standards. Product liability and sustainability including reliability, maintainability, serviceability, re-cyclability, re-manufacturability, disposability and reusability. Safety Engineering: Concepts of Safety Engineering and Management. COMAH (Control of Major Accident Hazards) and SEVESO Directives. System Safety Process. Process Safety and Environmental Protection (PSEP). Loss Prevention. Hazard reduction precedence. Safety Standards. Safety in Manufacturing, Chemical Process and Nuclear Power industries. Safety Management: Safety in the system life cycle. Organisational Management and Safety. System Safety Programme. Hazard Analysis. Process Safety Analysis: Preliminary Hazard Analysis (PHA). Hazard and operability studies (HAZOP). Failure modes effects and criticality analysis (FMECA). Hazard Operability.

Learning Outcomes

1	1.1 Critically appraise the use and review of complex reliability and safety engineering tools and their practical application in complex systems.
2	2.1 Apply reliability and safety tools and techniques to real-world examples in a wide spectrum of industries. 2.2 Estimate reliability parameters of simple and complex systems. 2.3 Calculate the reliability of complex systems taking into account. 2.4 Perform complex Reliability Block Diagrams calculations, use discrete and continuous statistical distributions in Reliability Analysis, and perform HAZOP and Fault Tree Analysis. 2.5 Carry out a complex Loss Prevention and Control analysis. 2.6 Apply System Safety Standards to complex applications. 2.7 Include Human Factors in complex.
3	3.1 Enhance your skills in data management; data presentation; scientific method; data interpretation; IT skills; systematic problem solving; and creative problem solving.

Learning, Teaching and Assessment Strategy

Concepts, theories and principles explored in formal lectures, and practiced in tutorials. Practical, cognitive and personal skills developed in problem solving exercises, tackled by working in small groups supported by members of academic staff. Animations and training packages from IChemE will be used to enhance learning and bring to life practical issues related to safety and loss prevention. Oral feedback is given during tutorials. The assessment will examine the wider learning outcomes expressed in the descriptor. Supplementary assessment is to repair deficiency in the original assessment.

Mode of Assessment

Type	Method	Description	Length	Weighting
Summative	Examination - closed book	Examination	2 hours	50%
Summative	Coursework	Coursework	0 hours	50%

Reading List

To access the reading list for this module, please visit <https://bradford.rl.talis.com/index.html>.

Please note:

This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.