GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2016-2017

Fire Safety Engineering (E900520)

Course size *(nominal values; actual values may depend on programme)*

Credits 6.0 **Study time 180 h** **Contact hrs** 22.0 h

Course offerings in academic year 2017-2018

A (semester 1)

Lecturers in academic year 2017-2018

Welch, Stephen	EDINBU lecturer-in-charge

Offered in the following programmes in 2017-2018	crdts	offering
International Master of Science in Fire Safety Engineering	6	A

Teaching languages

English

Keywords

Fire Safety Engineering, prescription, performance-based design

Position of the course

This course introduces the student to the principles of design for the fire safety engineering of various infrastructures, mainly buildings. A variety of different aspects of design are discussed (including: flammability, detection & alarm, smoke management, fire suppression, fire resistance, egress, etc.), with particular attention to systems of classification and design applications. The course distinguishes between 'prescriptive' and 'performance-based' approaches to design, with an emphasis on the appropriate application and use of codes and standards; references will be made to more advanced methods and opportunities to use engineering analysis approaches in fire safety engineering though training on use of advanced models is outside the scope. It is intended that the course will enable the student to carry out a simple fire safety engineering design in a critical manner with due consideration to any limitations, uncertainties or conservatisms which may be present.

Contents

1. Introduction (Codes and standards)
Principles of codes and standards, lessons from failures, prescriptive and performance-based design methodologies
- Life Safety Code (NFPA 101)
- Building regulations (Approved Document B)
- British Standards (BS476-20, BS9999, BS7974)
- Structural Eurocodes (EC0-9)

2. Flammability Standards
Concept of 'Flammability' and associated principles of storage, hazard classification
- Standard methods for establishing flammability of different materials.
- Classification and implications related to storage.
- Combustible and flammable liquids
Codes: NFPA 101, NFPA 30, ASTM D56-02, D92-05, D93-13, D1310, SFPE Handbook Ignition chapter

3. Fire Detection and Alarm
Principles of 'Fire Detection and Alarm'
- System categories, life and property protection
- Alarm and detection zones
- Alarm systems and response
- Detector technologies:
- Heat detectors

- Smoke detection: ionisation, photoelectric and other technologies.
- Other detection technologies, including multi-sensor
Code: BS5839-1

4. Smoke Management
Principles of 'Smoke Management'
- Fundamentals aspects of smoke movement in buildings
- Strategies for smoke control
- Active and passive systems; compartmentation requirements and specification of pressurised/depressurised spaces
Codes: BS EN12101-6, ADB

5. Fire suppression
Principles of 'Fire Suppression'
- Introduction to suppression systems
- Design of sprinkler systems
- Design of gaseous fire suppression systems
- Dry chemical fire suppression
Code: BS EN 12845:2004; Bryan ch. 7; BS ISO 15004-1/6:2008; Ewing et al. - Fire Technology 'Flame extinguishment properties of dry chemicals'

6. Fire Resistance
Understand current methods to establish 'Fire Resistance'
- Fire resistance requirements
- Compartmentation
- Methods for determining fire resistance of structural elements
- Steel, concrete, timber, etc.
Codes: BS476-20, BS9999, BS5950-8, BS8110-2, BS5268-4

7. Egress
Understand the principles of 'Egress'
- Prescriptive calculations for egress: minimum distances, minimum widths, stairways, disabled access and special facilities (the elderly, prisons, etc.).
- Means of escape
- Travel distances
- Escape routes and exit widths
- Human behaviour aspects
- ASET & RSET
- Risk profiles
- Egress models
Code: ADB, BS9999, BS7974:6

Initial competences

None are assumed.

Final competences

1 Appreciate the role and importance of fire safety engineering in the design of modern infrastructures
2 Describe the range of approaches adopted, with an awareness of distinctions and limitations
3 Justify fire design specifications with reference to appropriate codes and standards, with appropriate consideration of information that may be incomplete or uncertain
4 Undertake design calculations of fundamental aspects of fire systems and infrastructures
5 Demonstrate awareness of potentially conflicting demands, i.e. commercial, safety, environmental, ethical, etc.

Conditions for credit contract

This course unit cannot be taken via a credit contract

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Group work, lecture, seminar, self-reliant study activities

Extra information on the teaching methods

22 hours of lectures; 1 hour of formative assessment; 2 hours of summative assessment; 2 hours of programme level learning and teaching; 93 hours of directed and independent learning.
Formative feedback on practice tutorial.
Students will be given the opportunity to provide Stop, Start and Continue feedback and comments on this will be provided back by the course lecturer. Exam Post-Mortem

comments.

Learning materials and price

Approved Document B Life Safety
NFPA 30, 101 (extracts)
ASTM D56-02, D92-05, D93-13, D1310-01.
Kanury, A.M. (2002) Ignition of liquid fuels, chapter 8, pp. 2-188 – 2-199, SFPE Handbook, 3rd edition, NFPA
Structural Eurocodes, mainly Eurocode 1, 3 part 1-2
British Standards BS476-20, BS5268-4, BS5839-1, BS5950-8, BS7974-6, BS8110-2, BS9999, BS EN 12101-6, BS EN 12845, BS ISO 15004-1,6
Bryan, J.L. (2005) Fire Suppression and Detection Systems, Princeton
Ewing, C.T. et al (1989) Flame extinguishment properties of dry chemicals: extinction concentrations for small diffusion pan fires, Fire Technology, May 1989, pp. 134-149

References

Woodrow, M. *et al*. (2013) A nascent educational framework for fire safety engineering, Fire Safety Journal 58: 180-194
Brannigan, V.M. (2008) The regulation of technological innovation: The special problem of fire safety standards. FireSeat conference Fire & Building Safety in the Single European Market)
Rasbash, D. (1974) New variation on an old theme, Inaugural lecture presented by Professor D J Rasbash on 14 November 1974 at The Appleton Tower, Edinburgh
Bellido, C. *et al*. (2009) Performance assessment of pressurized stairs in high rise buildings, Fire Technology 45:189-200
Liam Ross - Invitation and Escape, The Architecture of Fire Safety Regulation
Milliken carpet factory fire case study

Course content-related study coaching

Evaluation methods

end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Open book examination

Examination methods in case of periodic evaluation during the second examination period

Examination methods in case of permanent evaluation

Assignment, skills test

Possibilities of retake in case of permanent evaluation

examination during the second examination period is not possible

Extra information on the examination methods

The assessment will be made on the basis of:
Intermittent Assessment (20%)
There is a single tutorial encompassing one or more of the course topics. This is preceded by an initial formative tutorial in the same style.
Written Examination (80%)
The written examination will be 2 hours long with 3 compulsory questions.

Calculation of the examination mark

Written Exam 80 %, Coursework 20 %