

Structural Design for Fire (E900522)

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) English

Lecturers in academic year 2017-2018

Law, Angus

EDINBU lecturer-in-charge

Bisby, Luke

EDINBU co-lecturer

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, Structural fire engineering, fire dynamic, structural mechanics, steel, concrete

Position of the course

The course will provide a brief overview of the fundamentals of fire behaviour in buildings and introduce simple methods of quantifying the threat it poses to structures. This will involve estimating the temperatures in building compartments and the temperatures that individual structural members get exposed to as a function of time. Fundamentals of the behaviour of common construction materials and estimation of the variation of mechanical properties of construction materials affected by fire (i.e. temperature rise). Structural analysis principles are then applied to the fire problem. Simple methods to carryout calculations to determine structural behaviour in the event of a fire will be presented followed by an introduction to advanced analytical and computational tools for analysing structural behaviour in fire. Finally an introduction to current (code based) design procedures and performance based design will be provided and a design project will be assigned.

Contents

1. Introduction
2. Fire Safety in Buildings
3. Fire and Heat
4. Room Fires
5. Fire Severity
6. Fire Resistance
7. Design of Structures Exposed to Fires
8. Steel Structures in Fire
9. Concrete Structures in Fire
10. Timber Structures in Fire
11. Playing with Fire
12. Advanced Analysis

Initial competences

None are assumed.

Final competences

- 1 Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions;
- 2 Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;

- 3 Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation;
- 4 Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux);
- 5 Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire.

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

Lecture, seminar

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.

Feedback will be available throughout the course by discussion with tutors and lecture staff.

Tutorials will also offer a route for formal, formative feedback.

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 will be provided.

Learning materials and price

- 1 Buchanan, A.H. (2001) Structural Design for Fire Safety. Wiley.
- 2 CEN (200#) BS EN 1991-1-2 - Eurocode 1: Actions on structures - Part 1-2: General actions - Actions on structures exposed to fire
- 3 CEN (2004) BS EN 1992-1-2 - Eurocode 2: Design of concrete structures - Part 1-2: General rules - Structural fire design.
- 4 CEN (2005) BS EN 1993-1-2 - Eurocode 3: Design of steel structures - Part 1-2: General rules - Structural fire design.
- 5 CEN (2004) BE EN 1995-1-2 - Eurocode 5: Design of timber structures - Part 1-2: General - Structural fire design.

References

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

Written 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

not applicable

Extra information on the examination methods

The assessment will be made on the basis of:

Intermittent Assessment 20%

Eight tutorials

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 %