GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2016-2017

Fire Science Laboratory (E900521)

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

Credits 9.0 **Study time 270 h** **Contact hrs** 66.0 h

Course offerings in academic year 2017-2018

A (semester 1)

Lecturers in academic year 2017-2018

Hadden, Rory	EDINBU lecturer-in-charge

Offered in the following programmes in 2017-2018	crdts	offering
International Master of Science in Fire Safety Engineering	9	A

Teaching languages

English

Keywords

Fire science, experimental methods, experimental uncertainty

Position of the course

This course consists of a series of laboratory sessions that will introduce the student to a variety of different experimental techniques of relevance to fire safety engineering. Each session will be introduced with a guide to relevant theory with the aim of providing the students with the fundamental knowledge to support understanding and interpretation of the experiments, as well as a safety briefing and guide to risk assessment. The use of standard tests and the application of the results to design will be emphasized.

Contents

1. Solid fuel ignition (4 hours)
This is the first of two laboratory demonstrations conducted to illustrate the different processes leading to ignition of combustible materials and is intended to provide insight on the ignition phenomenon.
- Application of ignition theory
- Piloted, Auto and Spontaneous ignition

2. Liquid fuel ignition (2 hours)
This is the second ignition laboratory demonstrations conducted to illustrate the use of ignition to establish flammability criteria.
- Flash point/fire point
- Physical processes and Standard tests

3. Reaction-to-fire behaviour of solids (2 hours)
In this laboratory, the cone calorimeter apparatus is used to examine the ¿reaction-to-fire¿ behaviour of solid fuels under different heat exposures, with specific attention to:
- Ignition time
- Subsequent energy release rate
From the measurements, the following parameters will be determined:
- Ignition temperature
- Thermal inertia

4. Flame spread (2 hours)
The physical mechanisms controlling flame spread will be described on the basis of a lateral flame spread test. The demonstration will emphasize the following aspects:
- Materials properties: influence of a material thermal and chemical properties on the rate of spread (liquid:solid, high density:low density, charring: non-charring, melting: non-melting)

- Orientation: upward, downward, horizontal, lateral.
- External heat flux
- Fuel thickness: thick:thin materials.

5. Fire Dynamics (6 hours)
The evolution of the burning rate and fire dynamics of fire plumes as a function of different parameters will be established, using open pool fires. Empirical and analytical formulations will be validated for various fire sizes with respect to characteristic parameters, i.e.:
- Centreline temperatures
- Entrainment rate
The effects of confining the fire within a compartment will also be examined and interpreted in relation to simple fire models.

Initial competences

None are assumed.

Final competences

1 Demonstrate a practical understanding of ignition (solid and liquid/gaseous).
2 Explain the phenomena of burning rate and fire spread.
3 Understand oxygen consumption calorimetry.
4 Have a practical knowledge of fundamental aspects of fire dynamics, including fire plumes.
5 Show an ability to document experimental outcomes, including handling measurement uncertainty and limitations of theory.

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

Demonstration, practicum, self-reliant study activities

Extra information on the teaching methods

66 hours of supervised practicals/workshops/studios; 2 hours of formative assessment; 15 hours of summative assessment; 4 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 staff. Discussion will form a key part of the oral assessments.
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.
Feedback comments will be provided on the individual lab reports.

Learning materials and price

Drysdale, D. An Introduction to Fire Dynamics, 3rd edition, John Wiley & Sons, 2011 (or earlier editions)

SFPE Handbook of Fire Protection Engineering, 4th ed., DiNenno, P.J. ed., NFPA, Quincy, MA, 2009 (or earlier editions)

References

Course content-related study coaching

Evaluation methods

continuous assessment

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

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

Examination methods in case of permanent evaluation

Report

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 100%:
Series of five experiments:

1. Solid fuel ignition
2. Liquid fuel ignition
3. Reaction-to-fire behaviour of solids
4. Flame spread
5. Pool fires and entrainment.

Calculation of the examination mark