

# CA4737: FIRE SCIENCE AND MODELLING

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**Effective Term**

Semester A 2025/26

## Part I Course Overview

**Course Title**

Fire Science and Modelling

**Subject Code**

CA - Civil and Architectural Engineering

**Course Number**

4737

**Academic Unit**

Architecture and Civil Engineering (CA)

**College/School**

College of Engineering (EG)

**Course Duration**

One Semester

**Credit Units**

3

**Level**

B1, B2, B3, B4 - Bachelor's Degree

**Medium of Instruction**

English

**Medium of Assessment**

English

**Prerequisites**

Nil

**Precursors**

CA3732 Fire Engineering and Piped Services

Students must have attempted (including class attendance, coursework submission, and examination) the precursor course(s) so identified.

**Equivalent Courses**

Nil

**Exclusive Courses**

Nil

## Part II Course Details

### Abstract

This course aims to provide students with in-depth theoretical base for fire science, fire dynamics and fire modelling and to further the study on the fire properties of materials in building technology.

### Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1 describe the in-depth knowledge in pyrolysis of solid, ignition phenomena, combustion mechanism, fire science and fire dynamics;	20			
2 describe the fire characteristics and fire resistance properties of building material;	15			
3 apply computational techniques in fire engineering to simulate building fire development and building evacuation;	30			x
4 apply the mathematical models to predict fire scenarios.	35			

#### A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

#### A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

#### A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

### Learning and Teaching Activities (LTAs)

LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1 Lectures and class tests	Students will engage with the in-depth knowledge in fire science and fire dynamics, fire characteristics and materials fire properties; and apply models for the fire research and engineering	1, 2, 3, 4	
2 Tutorials	Students will engage in group discussion in tutorials about the materials delivered in lectures	1, 2, 3, 4	

### Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Mid-term Test	1, 2, 3	20		No
2	Laboratory Report	2, 4	10		No
3	Assignments	1, 2, 3, 4	10	Students are allowed to use GenAI to create scripts for FDS simulations and also report writing.	Yes
4	Quiz	1, 2, 3, 4	10		No

**Continuous Assessment (%)**

50

**Examination (%)**

50

**Examination Duration (Hours)**

2

**Minimum Continuous Assessment Passing Requirement (%)**

30

**Minimum Examination Passing Requirement (%)**

30

**Additional Information for ATs**

To pass a course, a student must obtain minimum marks of 30% in both coursework and examination components, and an overall mark of at least 40%.

**Assessment Rubrics (AR)****Assessment Task**

Mid-term Test

**Criterion**

Ability to appreciate and apply CILO 1 to 2

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal level

### **Assessment Task**

Assignments

#### **Criterion**

Ability to appreciate CILO 1 to 4

#### **Excellent (A+, A, A-)**

High

#### **Good (B+, B, B-)**

Significant

#### **Fair (C+, C, C-)**

Moderate

#### **Marginal (D)**

Basic

#### **Failure (F)**

Not even reaching marginal level

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### **Assessment Task**

Examination

#### **Criterion**

Ability to appreciate and apply CILO 1 to 4

#### **Excellent (A+, A, A-)**

High

#### **Good (B+, B, B-)**

Significant

#### **Fair (C+, C, C-)**

Moderate

#### **Marginal (D)**

Basic

#### **Failure (F)**

Not even reaching marginal level

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## **Part III Other Information**

### **Keyword Syllabus**

Fire processes. Thermochemistry. Premixed and diffused flames. Thermal decomposition. Combustion. Compartmental fires. Building fire modeling. Use of computing models and computational fluid dynamic to simulate the fire and smoke behaviour.

### **Reading List**

#### **Compulsory Readings**

Title	
1	Nil

**Additional Readings**

Title	
1	Drysdale, D.D., An Introduction to Fire Dynamics, John Wiley & Sons.
2	Karlsson, B. and Quintiere, J.G., Enclosure Fire Dynamics, CRC Press.
3	G.H. Yeoh and K.K. Yuen - Computational Fluid Dynamics in Fire Engineering: Theory, Modelling and Practice, Edition 1, 2008, Elsevier.
4	Fire Dynamic Simulator: FDS-SMV official site: <a href="http://www.fire.nist.gov/fds/">http://www.fire.nist.gov/fds/</a>