CA3793: SYSTEM MODELLING FOR ARCHITECTURAL ENGINEERING

Effective Term
Semester A 2024/25

Part I Course Overview

Course Title
System Modelling for Architectural Engineering

Subject Code
CA - Civil and Architectural Engineering
Course Number
3793

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
Nil

Equivalent Courses
CA3791 Computer Aided Design Practices

Exclusive Courses
Nil

Part II Course Details

Abstract

The course aims to introduce the fundamental theories of different modelling techniques to the students for the design of different building services systems and to allow students to realize the critical design parameters of the systems.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the theories of different modelling approaches for building services systems	40	x		
2	Describe the design parameters required to model the building services systems	10	x		
3	Develop system modelling approaches to evaluate the performances of the building services systems	30			x
4	Apply the system modelling approaches to optimize the designs of the building services systems	20		x	

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	Lecture	Students will engage with key concepts and modelling techniques for different building services systems	1, 2, 3, 4	2 hours/week
2	Tutorial	Students will practice different computer software for building services systems modelling	1, 2, 3, 4	1 hour/week

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Mid-term Test	1, 2	20	
2	Assignments	2, 3, 4	30	

Continuous Assessment (%)
50

Examination (%)

50

Examination Duration (Hours)

2

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

1.1 ABILITY to DESCRIBE the theories of different modelling approaches for architectural engineering systems
1.2 ABUILITY to ENUMERATE the design parameters required to model the architectural engineering systems

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Assessment Task

Assignments

Criterion

2.1 ABUILITY to ENUMERATE the design parameters required to model the architectural engineering systems
2.2 ABILITY to DEVELOP system modelling approaches to evaluate the performances of the architectural engineering systems
2.3 ABILITY to USE the system modelling approaches to optimize the designs of the architectural engineering systems

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Examination

Criterion
3.1 ABILITY to DESCRIBE the modelling techniques for architectural engineering systems
3.2 ABILITY to APPLY the modelling technique to evaluate the performance of the architectural engineering systems

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Part III Other Information

Keyword Syllabus
Computational fluid dynamics, transport equation, Navier-Stokes equations, discretization, zone model, basic fire dynamics, mass-momentum-energy conversation equations, basic photometry, ray tracing techniques, heat transfer in buildings, cooling load temperature difference method (CLTD), cooling load factor method (CLF), ventilation, compartment fire, daylighting, artificial lighting, building thermal load, building energy analysis.

Reading List

Compulsory Readings

	Title
1	Drysdale, D. (1999) Introduction to fire dynamics, Chichester: John Wiley & Sons (QD516.D79 1999)
2	Versteeg, H.K. and Malalasekera, W. (2007) An introduction to computational fluid dynamics - the finite volume method, Perason: Prentice Hall (QA911 .V47 2007)
3	Sansoni, P., Mercatelli, L. and Farini, A. (2015) Sustainable indoor lighting, Springer London. (electronic resources in CityU)
4	CIBSE (1998) Building energy and environmental modelling, CIBSE: London (TH6021.A66 1998)

Additional Readings

	Title
1	Nil