City University of Hong Kong
Course Syllabus

offered by Department of Architecture and Civil Engineering
with effect from Semester A 2023/24

Part I Course Overview

Course Title:	Building Environment Modelling for Sustainability Analysis
Course Code:	CA5252
Course Duration:	1 Semester (Some courses offered in Summer Term may start a few weeks earlier than the normal University schedule. Please check the teaching schedules with CLs before registering for the courses.)
Credit Units:	3
Level:	P5
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

The course aims to provide students with an overview of the popular building energy modelling tools; an understanding of the underlying principles in modelling building energy systems; and an ability of application for system design and facilities management.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Describe the features and capabilities of common tools for building energy modelling.		✓		
2.	Discuss the principles, mechanisms, assumptions and limitations in modelling the typical building energy systems, such as HVAC and lighting.		✓	✓	
3.	Discuss the principles, mechanisms, assumptions and limitations in modelling the advanced building energy systems, such as trigeneration and renewable energy systems.		✓	✓	
4.	Apply building energy modelling for system design, energy management and retro-commissioning.			✓	
		100%			

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 self-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.

3. Teaching and Learning Activities (TLAs)
(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.				Hours / week (if applicable)
		1	2	3	4	
Lectures; seminars	Introduce and discuss the principles of common tools for building energy modelling of various building energy systems according to engineering practice and development.	✓	✓	✓	✓	2
Tutorials; site visits	Discuss and apply the skills of building energy modelling of various building energy systems for system design, energy management and retro-commissioning.		✓	✓	✓	1

Semester Hours:	3 hours per week
Lecture/Tutorial/Laboratory Mix:	Lecture (2); Tutorial (1); Laboratory (0)

4. Assessment Tasks/Activities
(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks / Activities	CILO No.				Weighting	Remarks
	1	2	3	4		
Continuous Assessment: 50%						
Mid-term test	✓	✓			25%	
Assignment		✓	✓	✓	25%	
Examination: 50% (duration: 2 hour(s))						
Examination	✓	✓	✓	✓	50%	
					100%	

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%

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Applicable to students admitted in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
Mid-term test	1. ABILITY to RECOGNIZE and EXPLAIN the key principles, mechanisms, assumptions and limitations of building energy modelling tools.	High	Significant	Basic	Not even reaching marginal levels
Assignment	1. CAPACITY to INQUIRE and ANALYSE the issues and relevant information and references with respect to given scenarios and context. 2. ABILITY to PRODUCE and ARTICULATE rational, substantiated and original discussion and/or suggestion.	High	Significant	Basic	Not even reaching marginal levels
Examination	1. ABILITY to EXPLAIN and DISCUSS the key principles, mechanisms, assumptions and limitations of building energy modelling tools for system design and facilities management.	High	Significant	Basic	Not even reaching marginal levels

Applicable to students admitted before Semester A 2022/23

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)/ Pass (P) on P/F basis	Failure (F)
Mid-term test	1. ABILITY to RECOGNIZE and EXPLAIN the key principles, mechanisms, assumptions and limitations of building energy modelling tools.	High	Significant	Moderate	Basic	Not even reaching marginal levels
Assignment	1. CAPACITY to INQUIRE and ANALYSE the issues and relevant information and references with respect to given scenarios and context. 2. ABILITY to PRODUCE and ARTICULATE rational, substantiated and original discussion and/or suggestion.	High	Significant	Moderate	Basic	Not even reaching marginal levels

Examination	1. ABILITY to EXPLAIN and DISCUSS the key principles, mechanisms, assumptions and limitations of building energy modelling tools for system design and facilities management.	High	Significant	Moderate	Basic	Not even reaching marginal levels

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus
(An indication of the key topics of the course.)

Thermal load solution method. Cooling and heating system simulation. Illuminance and lighting modelling. Modelling of advanced energy systems. Renewable energy system modelling. Application in system design and facilities management.

2. Reading List

2.1 Compulsory Readings
(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	Nil

2.2 Additional Readings
(Additional references for students to learn to expand their knowledge about the subject.)

1.	Code of Practice for Energy Efficiency of Building Services Installation, Electrical and Mechanical Services Department, Hong Kong SAR Government, 2021 (or latest edition).
2.	Code of Practice for Building Energy Audit, Electrical and Mechanical Services Department, Hong Kong SAR Government, 2021 (or latest edition).
3.	Technical Guidelines on Retro-commissioning, Electrical and Mechanical Services Department, Hong Kong SAR Government, 2018 (or latest edition).
4.	ASHRAE Handbook – Fundamentals 2021 (or latest edition)
5.	ASHRAE Handbook – HVAC Systems and Equipment 2020 (or latest edition)
6.	ASHRAE Handbook – Applications 2019 (or latest edition)
7.	EnergyPlus. https://energyplus.net/
8.	eQuest. https://www.doe2.com/equest/
9.	Design Builder. https://designbuilder.co.uk/
10.	TRNSYS. http://www.trnsys.com/
11.	COMSOL. https://www.comsol.com/
12.	DIALux. https://www.dial.de/en/dialux/