Course Title: Energy System Modeling for Buildings and Cities

Course Code: CIVL4310

No. of Credits: 3

Pre-/co-requisites:

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Course Description

The energy system plays a vital role in smart, low-carbon buildings and cities. Modeling the energy system is a fundamental step for predicting loads, designing energy-efficient solutions, and optimizing performance. This becomes even more crucial in the face of climate change and the pursuit of sustainable development.

This course offers both theoretical knowledge and practical experience in energy system modeling for buildings and cities. The lectures will delve into the underlying principles, mathematical laws, and practical examples that are needed to model the energy systems for cities and buildings. From a theoretical standpoint, the course will explore the fundamentals of heat transfer and building thermal dynamics. In terms of practical applications, the course will introduce building energy systems, especially Heating, Ventilation, and Air Conditioning (HVAC) System. Additionally, the course will introduce energy systems at different scales, focusing on the building-scale energy system (HVAC) as well as the city-scale energy system (district heating and cooling system). This course has four modules as shown below: review of thermal fundamentals, math of dynamic systems modeling, major components of HVAC system, and energy system modeling at different scales.

Assessments:

[List specific assessed tasks, exams, quizzes, their weightage]

Assessment Task	Contribution to Overall Course grade (%)
Mid-Term I	30%
Mid-Term II	30%
Final examination	40%

Required Texts and Materials

- Stanford, H.W. and Spach, A.F., 2019. Analysis and Design of Heating, Ventilating, and Air-Conditioning Systems. CRC Press. (electronic version is available in the HKUST library)