CA3707: MODELLING FOR SMART DIGITAL INFRASTRUCTURE SYSTEM

Effective Term
Semester A 2024/25

Part I Course Overview

Course Title
Modelling for Smart Digital Infrastructure System

Subject Code
CA - Civil and Architectural Engineering
Course Number
3707

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
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

This course aims to first introduce students with concepts of classical four-step modelling, which contains trip generation, trip distribution, mode choice and traffic assignment. Fundamental knowledge about the O-D (origin-destination) pair, road network, TAZ (traffic analysis zone) will be mentioned. Students will also learn microscopic transportation modelling approaches. To do so, this course will contain the following contents: the concept of traffic flow modelling and how to simulate and visualize traffic flows. In addition, this course will address how to carry out transportation infrastructure modelling. To this end, students will learn the fundamental concepts required for transportation infrastructure modelling and Building Information Modeling (BIM) as well as how to apply BIM to transportation infrastructure development projects.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Realize the relevant examples (Hong Kong, world-wide) of transportation modelling;	20	x		
2	Understand the fundamental concepts of O-D pair, road network, as well as four-step modelling;	20	x		
3	Understand the recent development in transportation modelling, such as: activity-base model, cloud application, cell phone data application;	20	x		
4	Develop skills in data analysis, model development, and result visualization;	20		x	
5	Develop ability to interpret the model result and explain its implication in transportation planning and policy.	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	Introduce key issues, sources, applications, and techniques related to transportation modelling	1, 2, 3, 4, 5	2 hours/week
2	Tutorial	Handle actual datasets and learn how to use software and analytical techniques in practical ways	3, 4, 5	1 hour/week

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	In-class quiz	1, 2, 3	20	
2	Term project	1, 2, 3, 4, 5	20	
3	Assignments	1, 2, 3, 4, 5	10	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

3

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

In-class quiz

Criterion

Comprehensive and unconventional understandings of basic concepts of transportation modelling

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

Term project

Criterion

Ability to develop transportation model and interpret the modelling results with visualization.

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
Ability to create multiple transportation infrastructure models based on BIM.

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
Ability to understand the fundamental concept of demand modelling, and to use the concept for simple calculation.

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

Classical Four-step Modelling; Traffic Flow Modelling; Transportation Infrastructure Modelling, Building Information Modelling (BIM) for Transportation Systems; Visualization

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	User Manual of Cube® (Citilabs)
2	Ben-Akiva, Moshe and Lerman, Steven R. (1985) Discrete Choice Analysis: Theory and Application to Travel Demand, MIT Press.
3	ITE Trip Generation Manual