

CA4710: HIGHWAY ENGINEERING

Effective Term

Semester A 2024/25

Part I Course Overview

Course Title

Highway Engineering

Subject Code

CA - Civil and Architectural Engineering

Course Number

4710

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

CA2676 Transportation Engineering

Precursors

Nil

Equivalent Courses

CA4685 Traffic and Highway Engineering

Exclusive Courses

Nil

Part II Course Details

Abstract

Practically, all highway design problems are computational in nature. With the background provided in the course CA3561 Transportation Engineering as a prerequisite, more in-depth advanced topics will be covered in this course. The course

intends to provide advanced techniques on solving highway engineering design problems. The objective is to equip students with various advanced knowledge and methods to tackle realistic highway design methods. Course contents cover detailed demand forecast procedures realizing the future requirements of highway infrastructures, highway pavement material testing methods and data, empirical design method for flexible and rigid pavement structure, detailed design procedures for geometric roundabout junctions and phase-based signal-controlled junctions. Highway alignment designs fulfilling vertical and horizontal safety requirements. Analysing future travel demand and supply patterns and optimizing selection criteria for selection of highway project implementations.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if DEC-A1 app.)		DEC-A2	DEC-A3
1	Understand the relationships between future travel demands and size requirements of highway infrastructures;	20	x		
2	Apply empirical design codes for highway flexible and rigid pavements;	15		x	
3	Apply codes of practices for roundabout junction design and use phase-based approach for signal-controlled junction design;	20		x	
4	Design highway alignments satisfying horizontal and vertical safety requirements;	20			x
5	Understand how large-scale highway projects being selected optimally using systematic criteria.	25	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	Explain key concepts, such as theories related to highway engineering design aspects	1, 2, 3, 4, 5	3 hours/wk
2	Individual assignment	Apply the advanced design methods for roundabout and signal-controlled junctions	1, 2, 3, 4, 5	
3	Mid-term test	Test students' understanding on various taught materials	1, 2, 3	

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Individual assignments	1, 2, 3, 4, 5	30	
2	Mid-term test	1, 2, 3	20	

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**

Individual assignments

Criterion

1.1 CAPACITY for SELF-DIRECTED LEARNING to understand the principles of various commonly used junction designs

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

Mid-term test

Criterion

2.1 ABILITY to UNDERSTAND the taught methodology and procedures in using the correct calculation and design techniques

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 UNDERSTAND the taught methodology and procedures in using the correct calculation and design techniques in realistic and practical situations

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

Demand and supply forecast for highway projects, Designs of roundabout and signal-controlled junctions (using phase-based approach), Empirical highway pavement designs, Highway alignment designs, Large-scale highway project selection

Reading List

Compulsory Readings

Title	
1	Nicholas J. Garber, Lester A. Hoel. 2015, Traffic and highway engineering, 5th Edition, Satmford, CT : Cengage Learning.
2	Athanassios Nikolaidis 2015, Highway engineering : pavements, materials and control of quality, Taylor & Francis.

Additional Readings

Title	
1	Hong Kong Transport Department, Transport Planning and Design Manuals.
2	Hong Kong Highways Department, Guidance Notes on Pavement Design.
3	Supporting public service transformation: cost benefit analysis guidance for local partnerships, GOV.UK