

CA5108: VIRTUAL DESIGN AND CONSTRUCTION

Effective Term

Semester B 2025/26

Part I Course Overview

Course Title

Virtual Design and Construction

Subject Code

CA - Civil and Architectural Engineering

Course Number

5108

Academic Unit

Architecture and Civil Engineering (CA)

College/School

College of Engineering (EG)

Course Duration

One Semester

Credit Units

3

Level

P5, P6 - Postgraduate Degree

Medium of Instruction

English

Medium of Assessment

English

Part II Course Details

Abstract

The application of computers and Information Technology is vital to all industries, no need to mention the construction industry. This course aims at teaching how to implement Virtual Design and Construction (VDC) for building and infrastructure projects from both theoretical and practical perspectives. Upon completing this course, students shall be able to describe, implement and evaluate information/views/opinions related to VDC. Because Building Information Modeling (BIM) is an essential to implement VDC, students will also learn fundamental concept of BIM, up-to-date application examples of BIM, and how to apply BIM-related software packages. The course further explores the integration of emerging technologies—including Artificial Intelligence (AI), the Internet of Things (IoT), machine learning, and simulation modeling—into VDC workflows to enhance decision-making, predict project outcomes, optimize construction processes, and enable smart, data-driven project delivery. Students will be equipped with the most advanced knowledge of applying Information Technology and AI to the construction industry.

Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	appraise and assess the essential principles of virtual design and construction;	x	x	
2	identify the latest development of IT applications in VDC and evaluate their contribution to the construction industry, including emerging technologies such as AI, IoT, machine learning, and simulation modeling, and evaluate their impact on construction project delivery.	x	x	
3	apply the principles of VDC	x	x	
4	perform VDC using available software packages.	x	x	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	Lectures	On topics related to construction management in related to VDC	1, 2, 3, 4	2 hrs/week
2	Tutorials / Presentation	On selected topics	1, 2, 3, 4	1 hrs/week

Additional Information for LTAs

Semester Hours: 3 hours per week

Lecture/Tutorial/Laboratory Mix: Lecture (2); Tutorial (1); Laboratory (0)

Assessment Tasks / Activities (ATs)

ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?	
1	Assignments	1, 2, 3, 4	25	-	No
2	Term Project	1, 2, 3, 4	50	-	No
3	Mid-term Examination	1, 2, 3, 4	25	-	No

Continuous Assessment (%)

100

Minimum Continuous Assessment Passing Requirement (%)

40

Minimum Examination Passing Requirement (%)

0

Assessment Rubrics (AR)

Assessment Task

Assignments (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Ability to understand, analyze and apply the theories acquired in the course

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 (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Ability to understand, Analyze and apply the theories acquired in the course

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 Examination (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Ability to understand, Analyze and apply the theories acquired in the course

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Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Assignments (Applicable to students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Ability to understand, analyze and apply the theories acquired in the course

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Term Project (Applicable to students admitted from Semester A 2022/23 to Summer Term 2024)

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Mid-term Examination (Applicable to students admitted from Semester A 2022/23 to Summer Term 2024)

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Part III Other Information**Keyword Syllabus**

Development of IT applications in construction; Virtual Design and Construction (VDC); Building Information Modelling (BIM); 4D simulation; Clash Detection; Cost Estimation; Compliance Checking; Revit; MS Project; Navisworks; Industry Foundation Classes (IFC); AutoCAD Civil 3D; Smart Construction; Artificial Intelligence; machine learning; IoT; Simulation modelling

Reading List**Compulsory Readings**

Title	
1	Nil

Additional Readings

Title	
1	BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors by Chuck Eastman, Paul Teicholz, Rafael Sacks, and Kathleen Liston (2011)
2	Automation in Construction: http://www.journals.elsevier.com/automation-in-construction/
3	Journal of Computing in Civil Engineering: http://ascelibrary.org/journal/jccee5
4	BIM Journal: http://www.bimjournal.com
5	Autodesk AI: https://www.autodesk.com/hk/solutions/autodesk-ai