

CA5321: AI AND ROBOTICS FOR CONSTRUCTION AND ASSET MANAGEMENT

Effective Term

Semester A 2026/27

Part I Course Overview

Course Title

AI and Robotics for Construction and Asset Management

Subject Code

CA - Civil and Architectural Engineering

Course Number

5321

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

Prerequisites

Nil

Precursors

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Additional Information

Nil

Part II Course Details

Abstract

This course introduces the principles and applications of artificial intelligence (AI), robotics, and automation across the lifecycle of built assets, with an emphasis on the construction, operation, and maintenance (O&M) stages. It aims to equip students with the knowledge and skills to understand, apply, and critically evaluate AI- and robotics-enabled solutions that are transforming the construction industry.

The course is delivered through lectures, coding workshops, case studies, and student projects. Students will learn fundamental AI techniques and gain hands-on experience through Python-based labs. Applications of AI and robotics and automation technologies will be introduced through case studies and industry examples. By the end of the course, students will be able to identify appropriate AI and robotics technologies for construction and asset management, apply them to analyze data, and critically assess their feasibility, benefits, and risks. A final group project will allow students to design, implement, and present an AI- or robotics-enabled solution to a selected challenge in construction or O&M, integrating both technical analysis and managerial evaluation.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain and compare the fundamental principles of AI and robotics relevant to construction and asset management.		x	x	
2	Identify and contextualize potential applications of AI and robotics in construction, and operation and maintenance (O&M) of buildings and infrastructure.		x	x	
3	Apply appropriate AI techniques to analyze data and address challenges in construction and O&M.			x	x
4	Critically evaluate the feasibility, benefits, and risks of AI and robotics solutions, and assess their implications for construction safety, cost, quality, and sustainability.		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	Introduce the concepts, principles, applications of AI and robotics in construction and asset management	1, 2, 3, 4	2
2	Tutorials, Site visits	Explore and discuss applications of AI and robotics in construction and asset management through hands-on exercises, case studies, or site visits.	1, 2, 3, 4	1

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks ("- for nil entry)	Allow Use of GenAI?
1	Midterm Test	1, 2, 4	20	-	No
2	Assignment	1, 2, 3, 4	80	-	Yes

Continuous Assessment (%)

100

Examination (%)

0

Minimum Continuous Assessment Passing Requirement (%)

40

Minimum Examination Passing Requirement (%)

0

Assessment Rubrics (AR)**Assessment Task**

Mid-term Test

Criterion

Ability to explain, analyze and apply the concepts, mechanisms, and technologies of AI and robotics for construction and asset management

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 identify and evaluate potential applications of AI and robotics in construction and asset management.
Ability to apply principles and methods of AI and robotics in construction and asset management.

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

Reading List

Additional Readings

Title	
1	Bock, T., & Linner, T. (2016). Construction Robots Elementary Technologies and Single-Task Construction Robots. In Construction Robots: Elementary Technologies and Single-Task Construction Robots (p. I). Cambridge: Cambridge University Press.
2	Sacks, R., Eastman, C. M., Lee, G., & Teicholz, P. (2018). BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers (3rd ed.). Wiley.
3	Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press.
4	Voulgaris, Z., & Bulut, Y. E. (2018). AI for Data Science: Artificial Intelligence Frameworks and Functionality for Deep Learning, Optimization, and Beyond. Technics Publications.