

Artificial Intelligence Applications in Construction Engineering and Management

Code CEM-817	Credit Hours 3+0
------------------------	----------------------------

Course Description

This course provides an in-depth overview of artificial intelligence (AI) with a strong focus on machine learning (ML) and data analysis techniques and their applications in construction engineering and management. It covers fundamental AI concepts, emphasizing supervised and unsupervised learning in the construction context. Key topics include data collection and preprocessing, predictive analytics for project scheduling and cost estimation, and computer vision for site monitoring and safety inspections. The course also explores natural language processing and Building Information Modeling (BIM). Specific ML algorithms covered in the course include linear regression, logistic regression, decision trees, k-means clustering, and neural networks. Additionally, it addresses ethical and legal considerations in AI. Through comprehensive theory, students will learn how to leverage ML and data analysis to improve decision-making and optimize various aspects of construction projects.

Textbook(s):

1. Zhang, L., Pan, Y., Wu, X., & Skibniewski, M. J. (2021). "Artificial Intelligence in Construction Engineering and Management." In Lecture Notes in Civil Engineering. Springer Singapore.

Reference Book(s):

1. Tarabishy, S., Kosicki, M., and Tsigkari, M. (2021). "Artificial Intelligence for the Built Environment." Springer International Publishing.

Prerequisites

CS 114 (Fundamentals of Programming)

ASSESSMENT SYSTEM FOR THEORY

Quizzes	10%
Assignments	10%
Mid Terms	25%
Term Project	10%
ESE	45%

Teaching Plan

Week No.	Topics	Learning Outcomes
1	Introduction	Course outline, objectives, teaching plan, assessment methods, and review of key concepts.
2-6	Introduction to AI and ML, Supervised Learning, Unsupervised Learning, Data Collection and Preprocessing, Predictive Analytics	Understand the fundamental concepts of AI and ML, including supervised and unsupervised learning. Learn the principles of data collection and preprocessing specific to construction projects. Explore predictive analytics techniques for project scheduling and cost estimation.
7-8	Building Information Modeling (BIM), Facility Management	Learn the integration of AI with BIM and its applications in design and construction management. Understand AI applications in facility management, including predictive maintenance.
9	MID-TERM EXAM	
10-12	Computer Vision and Image Recognition, Natural Language Processing	Understand the basics of computer vision and its applications in site monitoring and safety inspections. Learn the principles of natural language processing and its applications in document analysis and chatbot assistants.
13-17	Automation in Construction, Safety Management, Project Scheduling, Ethical and Legal Considerations in AI	Understand how AI-driven automation is applied in construction processes. Learn about AI techniques for enhancing construction safety. Explore the use of AI in project scheduling and management. Discuss the ethical and legal implications of using AI in construction projects.
18	End Semester Exams	