Artificial Intelligence in the Built Environment

Course Code	Credit Hours
CE-312	2-0

Course Description

This course explores the transformative impact of AI technologies on the construction industry. This course covers the fundamentals of AI, including machine learning, data analytics, and automation, and their applications in design, construction, and facility management. Students will learn how AI can optimize project planning, improve safety, enhance sustainability, and drive innovation. Through case studies participants will gain experience in leveraging AI tools to address real-world challenges in the built environment, preparing them for the future of smart construction and infrastructure.

Text Book:

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

2. 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.

3. Seaton, H. (2020). The construction technology handbook, Wiley

4. Bock, T., & Linner, T. (2015). Robot-Oriented Design. Cambridge University Press.

Reference Book: Nil

Prerequisites:

Nil

ASSESSMENT SYSTEM FOR THEORY

	Without Project (%)	With Project/Complex Engineering Problems (%)
Quizzes	15	10-15
Assignments	10	5-10
Mid Terms	25	25
Project	-	5-10
End Semester Exam	50	45-50

ASSESSMENT SYSTEM FOR LAB

Lab Work/ Psychomotor Assessment/ Lab Reports	70%
Lab Project/ Open Ended Lab Report/ Assignment/ Quiz	10%
Final Assesment/ Viva	20%

Teaching Plan

Weeks	Topics/Learning Outcomes
1	Introduction to AI and Machine Learning Overview of AI techniques AI-based applications in Building Information Modeling Overview of AI in built environment Introduction to AI and Machine Learning, Overview of AI techniques
2	PEAS Concept, Inputs, Outputs, Processes, AI agents, Agent function and agent program, Agent and Environment Types AI concepts and systems overview, Inputs, Outputs, Processes,

3	Exploration of Datasets and their Analysis Data collection and analysis techniques, Data-driven decision-making algorithms Construction Data and Analytics, Data collection and analysis techniques, Data-driven decision-making, ~~Predictive analytics in the construction industry.~~	
4	Frequent pattern Mining, Search algorithms, Initial and goal states	
5	Supervised vs Unsupervised Machine Learning Techniques Exploration of Supervised Learning Techniques Machine learning, and their application to the construction industry. Supervised vs Unsupervised learning,	
6	Regression Analysis Linear regression Logistic Regression Linear regression, Logistic Regression, Cost function, Bias and Variance, Learning curves, Error Analysis.	
7	Clustering, Bayes Classification, KNN Classification Cost function, Bias and Variance, Learning curves, Error Analysis.	
8	Basics of Python Programming Introduction to Anaconda IDE	

9	**MID-SEMESTER EXAM**
10	Overview of Artificial neural network (ANN) models, Usage of ANNs in different applications AI applications, Computer vision, Natural Language processing.
11	Building Information Modelling Modelling in Revit Building Information Modeling (BIM) and AI, Overview of BIM and Python Programming in BIM
12	Basics of Python Programming in BIM Use of AI techniques for processing and analyzing BIM data.
13	Weka's exploration and its usage. AI applications
14	Case Studies Intelligent transportation system, Soil Mechanics Case Studies, Intelligent transportation system
15	Case Studies Intelligent scheduling, resource allocation, and risk management Case Studies, Intelligent scheduling, resource allocation, and risk management
16	Case Studies Use of AI in Structural Design, Open AI construction Case Studies, Structural health monitoring IoT, Robotics

	Ethical Considerations and Challenges, Bias, privacy, and security, how to address these challenges.
17-18	**End Semester Exam**

Practical: Nil.