

COURSE CODE: CE-451

COURSE NAME: ARTIFICIAL INTELLIGENCE IN THE BUILT ENVIRONMENT

CREDIT HOURS: Theory = 3
Practical = 0
Total = 3

CONTACT HOURS: Theory = 48
Practical = 0
Total = 48

PREREQUISITES: -

MODE OF TEACHING:

Instruction: Three hours of lecture per week 100%

Practical/ Laboratory Demonstration: -

COURSE DESCRIPTION:

This course will introduce students to fundamental concepts of coding, computing, machine learning, and artificial intelligence, thus providing them with modern research tools necessary to develop state-of-the-art industrial and academic output.

COURSE OBJECTIVES:

Artificial Intelligence (AI) is a constantly and actively growing and changing field. After the successful completion of the course, the students will be able to:

- To introduce the basics of AI and its potential applications in the construction industry.
- To develop skills to design, implement, and manage AI-based systems and tools for construction projects.
- To understand how AI can be used to optimize construction processes and improve project performance.

RELEVANT PROGRAM LEARNING OUTCOMES (PLOs):

The course is designed so that students will achieve the PLOs:

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|------------------------------------|-------------------------------------|-----------------------------------|-------------------------------------|
| 1 Engineering Knowledge: | <input type="checkbox"/> | 7 Environment and Sustainability: | <input type="checkbox"/> |
| 2 Problem Analysis: | <input type="checkbox"/> | 8 Ethics: | <input type="checkbox"/> |
| 3 Design/Development of Solutions: | <input checked="" type="checkbox"/> | 9 Individual and Team Work: | <input type="checkbox"/> |
| 4 Investigation: | <input type="checkbox"/> | 10 Communication: | <input type="checkbox"/> |
| 5 Modern Tool Usage: | <input checked="" type="checkbox"/> | 11 Project Management: | <input type="checkbox"/> |
| 6 The Engineer and Society: | <input type="checkbox"/> | 12 Lifelong Learning: | <input checked="" type="checkbox"/> |

COURSE LEARNING OUTCOMES:

Upon successful completion of the course, the student will demonstrate competency by being able to:

S.No	CLO	Domain	Taxonomy Level	PLO
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1.	Evaluate the impact of machine learning algorithms on data related to built environment using an AI tool and gain insights to inform potential optimizations	Cognitive	5	5
2.	Design a machine learning-based solution for a problem in the built environment industry using a machine learning technique.	Cognitive	6	3
3.	Demonstrate independent learning ability by analysing different datasets and implement an appropriate machine learning algorithm to the real-world case study in the domain of built environmental.	Cognitive	3	12

TOPICS COVERED AND ITS MAPPING TO CLOs:

Theory:

Weeks	Topic	Reading assignment /Homework	CLO No.	PLO No.	Assessment methodology	Learning domain	Level of learning 1-6
1	Introduction to AI and Machine Learning Overview of AI techniques AI-based applications in Building Information Modeling Overview of AI in built environment	Lecture	1	5	Assignments, Quizzes, Mid Semester Exams.	Cognitive	5
2	PEAS Concept, Inputs, Outputs, Processes, AI agents, Agent function and agent program, Agent and Environment Types	Lecture, Handouts, Textbook 1 HW 1, Quiz 1	1	5			5
3	Exploration of Datasets and	Lecture, Handouts,	3	12	Assignments, Quizzes, Mid	Cognitive	3

10	Overview of Artificial neural network (ANN) models, Usage of ANNs in different applications	Lecture Handouts Assignment 3, Quiz 3	2	3	Assignments, Quizzes, Mid Semester Exams.	Cognitive	6
11	Building Information Modelling Modelling in Revit	Lecture	3	12			3
12	Modelling in Revit (Contd.) Basics of Python Programming in BIM	Lecture, Assignment 4, Quiz 4	3	12			3
13	Weka's exploration and its usage	Lecture	3	12			3
14	Case Studies Intelligent transportation system Soil Mechanics	Lecture, Assignment 5, Quiz 5	1	5			5
15	Case Studies Intelligent scheduling, resource allocation, and risk management	Lecture	1	5			5
16	Case Studies Use of AI in Structural Design Open AI construction	Lecture	1	5			5
17	Project/ Major Assignment Demos and		2	3			6

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18	ESE						

Textbooks and Reference books

1. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, 2nd Edition
2. The History of Artificial Intelligence Author Chris Smith, Brian McGuire, Ting Huang,
3. Tarabishy, S., Kosicki, M., & Tsigkari, M. (2021). Artificial Intelligence for the Built Environment. Springer International Publishing.

ASSESSMENT SYSTEM:

1. CLOs Assessment

Cognitive
Spreadsheet

2. Relative Grading

Theoretical / Instruction		100%
Assignments	10%	
Quizzes	10%	
Mid Exam	30%	
End Semester Exam	50%	
Total		100%

Written By (Instructor)	Dr. Aisha Shabbir, Muhammad Usman Hassan
Reviewed By (DLQEC)/HoD	Dr. Junaid Ahmed/Dr Muhammad Usman Hassan
Approved By (Assoc Dean)	Dr. S Muhammad Jamil