INSTITUTE	**FACULTY OF TECHNOLOGY**
PROGRAM	**BACHELOR OF TECHNOLOGY (CIVIL ENGINEERING)**
SEMESTER	**7**
COURSE TITLE	**ARTIFICIAL INTELLIGENCE & MACHINE LEARNING FOR CIVIL ENGINEERING**
COURSE CODE	**01CI0715**
COURSE CREDITS	**4**

Objective:

1 To understand the concepts and techniques of AI and ML.
2 To explore the applications of AI and ML in civil engineering
3 To case studies showcasing the integration of AI and ML in civil engineering projects.
4 To develop skills in implementing AI and ML algorithms for solving preliminary civil engineering problems

Course Outcomes: After completion of this course, student will be able to:

1 Identify the basics of Artificial Intelligence and Machine Learning.
2 Indicate how AI and ML can improve different activities in civil engineering.
3 Apply AI and ML algorithms to solve problems in civil engineering.
4 Develop skills to apply AI and ML algorithms for solving problems in civil engineering.

Pre-requisite of course:A foundational understanding of AI/ML, programming proficiency, statistical knowledge, domain expertise and familiarity with relevant tools.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	0	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction to AI and ML** Scope of the Course, Introduction to AI and ML, Brief review of History of AI and ML, Related fields, Introduction to Artificial Neural Networks: Biological Neurons and Biological Neural Networks, Artificial Neural Networks, Activation Functions, Perceptron NN, Multilayer Perceptron NN, Back-propagation Neural Networks, Training Methods, Basic definition of supervised and unsupervised Learning., Introduction to Machine Learning: Introduction (Different Types of Learning) Hypothesis Space, Inductive Bias, Evaluation and Cross Validation	10

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Contents : Unit	Topics	Contact Hours
2	**Structural Analysis and Design Optimization** Application of AI/ML in Structural Analysis, Design Optimization Techniques using Genetic Algorithms and Neural Networks, Case Studies: Predictive Maintenance and Optimal Design Solutions, Structural health monitoring with AI techniques, Case studies: predictive modeling for structural integrity assessment	10
3	**Design Optimization using Machine Learning** Introduction to design optimization, Genetic algorithms and optimization techniques, Neural network-based optimization, Application of ML in optimal design of civil engineering structures	14
4	**AI and ML in Construction Management** Introduction to construction management, Schedule optimization using ML algorithms, Resource allocation and risk management with AI, Predictive analytics for infrastructure maintenance, Case studies: AI-driven construction project management systems	10
5	**Infrastructure Monitoring and Management** Introduction to infrastructure monitoring, IoT and sensor data integration with ML, Implementation of AI and ML algorithms using Python, Ethical considerations in AI and ML applications, Regulatory challenges and standards in civil engineering, Future trends and emerging technologies in AI and ML for civil engineering	12
Total Hours		**56**

Textbook :

1 Fuzzy Logic, and Genetic Algorithms : Synthesis and Applications, S. Rajshekharan, G. A. Vijayalakshmi Pai, PHI, 2001

References:

1 Machine Learning, Machine Learning, Anuradha Srinivasaraghavan,, Vincy Joseph, Wiley, 2001

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
5.00	10.00	30.00	30.00	15.00	10.00

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Instructional Method:

1. Prerequisite of the course and its pattern shall be discussed on the commencement of the course.
2. Lectures shall be conducted in class room using various teaching aids.
3. Presence in all academic sessions is mandatory which shall carry 5% marks of the total internal evaluation
4. At the end of each unit/topic an assignment based on the course content shall be given to the students which shall carry 5% weight age for timely completion and submission of the assigned work.

Supplementary Resources:

1. https://www.geeksforgeeks.org/machine-learning/

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