COURSE TITLE	**FUNDAMENTAL OF AI & ML**
COURSE CODE	**01ML0202**
COURSE CREDITS	**4**

Objective:

1 To equip students with a foundational understanding of Artificial Intelligence (AI) and Machine Learning (ML), including their applications in engineering, while developing skills in data preparation, preprocessing, and the selection, implementation, and analysis of appropriate AI & ML algorithms for problem-solving in mechanical engineering.

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

1 Understand the fundamentals of AI & ML
2 Implement data preparation and data preprocessing techniques of AI & ML applications
3 Identify the suitable AI & ML algorithm for given problem
4 Analyze the output of the AI & ML
5 Apply AI & ML in mechanical engineering domain

Pre-requisite of course:NA

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction AI & ML** Industrial Revolution, Definition & Characteristics of AI, History of AI, Difference between AI & ML Deep Learning, Need for AI in Mechanical Engineering, Applications, Advantages & Disadvantages of AI, Future of AI in Mechanical Engineering	4
2	**Data Preparation for AI & ML** Basic Types of data in Machine Learning – Exploring structure Data – Numerical data – Categorical data – Data Quality and Remediation – Data Preprocessing, Descriptive models – predictive models – prescriptive models – Applications of descriptive, predictive and prescriptive models, Training the models - Evaluating the performance of the model – Improving the performance of the model	8
3	**Machine Learning Techniques** Introduction to Machine Learning, Classification of Machine Learning Techniques-Supervised- Regression Problems, Classification Problems, Unsupervised- Clustering techniques, Association rules and Reinforcement learning	8

Contents : Unit	Topics	Contact Hours
4	**Fundamental of Artificial Intelligence** Introduction of AI, Classification of AI, Searching for Solutions, Knowledge representation, Expert system, Algorithms for Planning with State Space Search	8
5	**Advancements and Applications in AI & ML** Advance AI Techniques- Fuzzy Logic, Genetic Algorithms (GA), Particle Swarm Optimization (PSO) Language, Swarm-Based Path Planning and their application, Advance AI Techniques- CNN, RNN, Ensemble learning and their applications	8
Total Hours		**36**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Identify the data and data collection techniques for AI & ML application** Identify the data and data collection techniques for AI & ML application	2
2	**Python programming for data preparation and preprocessing techniques for AI & ML application** Python programming for data preparation and preprocessing techniques for AI & ML application	2
3	**Python programming for data visualization** Python programming for data visualization	2
4	**Python programming for regression problem** Python programming for regression problem	2
5	**Python programming for classification problem** Python programming for classification problem	2
6	**Python programming for artificial neural network** Python programming for artificial neural network	2
7	**Python programming for K Means clustering** Python programming for K Means clustering	2
8	**Python programming for Apriori Algorithm** Python programming for Apriori Algorithm	2
9	**Python programming for Reinforcement learning** Python programming for Reinforcement learning	2
10	**Python programming for Hill climbing algorithm** Python programming for Hill climbing algorithm	2
11	**Python programming for Expert systems** Python programming for Expert systems	2
12	**Case study on application of AI & ML in Mechanical Engineering** Case study on application of AI & ML in Mechanical Engineering	2
Total Hours		**24**

Textbook :

1 Artificial Intelligence and Machine Learning, Chandra S.S.V. & Shekhar S., PHI Learning, 2021

2 Artificial Intelligence, Saroj Kaushik, Cengage Learning India, 2011

References:

1 Fundamentals of Artificial Intelligence and Machine Learning, Fundamentals of Artificial Intelligence and Machine Learning, Dr. D.P. Acharjya & A. Anitha, Wiley India, 2020

2 Artificial Intelligence: A Modern Approach, Artificial Intelligence: A Modern Approach, Stuart Russell & Peter Norvig, Pearson, 2020

3 Machine Learning for Absolute Beginners, Machine Learning for Absolute Beginners, Oliver Theobald, Scatterplot Press, 2021

4 Python Machine Learning, Python Machine Learning, Sebastian Raschka and Vahid Mirjalili, Packt Publishing, 2020

5 Machine Learning with Python: Principles and Techniques, Machine Learning with Python: Principles and Techniques, Parteek Bhatia, Cambridge University Press, 2020

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 and evaluation					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
10.00	30.00	20.00	20.00	20.00	0.00

Instructional Method:

1 Presentation

2 Programming

Supplementary Resources:

1 https://onlinecourses.nptel.ac.in/noc23_cs18/preview