SEMSTER-I

(1) NAME OF THE COURSE: Introduction to Artificial Intelligence & Machine Learning

(2) OBJECTIVE OF THE COURSE:

Basic objectives of the course are the following:

- Detailed introduction to Artificial Intelligence (AI) & Machine Learning (ML)
- Overview of past, present and possible future status of AI & ML
- Understanding interconnections of AI, ML & Data Science

![Figure 1: Interconnections of AI, ML, DL and Data science.](image)

- Overview of fundamental aspects of Machine Learning and their classifications
- Different useful techniques for ML: Supervised & Unsupervised methods
A flow-chart of the teaching objectives is given in the following schematic diagram. A fundamental framework has been given. Students have been taught based on that framework. After analyzing results and assessing feedback, we shall try to modify/improve the course.

![Flow-chart of teaching objectives](image)

*Figure 2: Schematics of teaching objectives of the present course.*

(3) **LEARNING OUTCOMES:**

After successfully completing the course, students are expected to:

- Learn and understand fundamental mathematical methods required for practicing ML
- Distinguish between supervised and unsupervised learning processes
- Have a hands-on introduction to different techniques of ML
- Apply and solve optimization problems
- Solve various real-life problems using ML
(4) **DETAILED SYLLABUS:**

**Section 1: Introduction AI & ML and Essential tools for ML**

- Overview
- Introduction to Artificial Intelligence (AI): Cognitive science and perception problem - a brief history of AI and its applications
- What is Machine Learning?
- AI vs. ML
- Types and Applications of ML
- Introduction to Essential Math for ML:
  - Linear algebra and matrix decomposition
  - Multivariate Calculus and Optimization
  - Statistics & Probability theory
- Introduction to Python/ MATLAB for solving problems in ML

**Section 2: Supervised Machine Learning**

- Introduction to Supervised Machine Learning
  - Classification
  - Linear Regression
  - Logistic Regression
  - Gradient descent
  - Decision tree
  - Support Vector Machines

**Section 3: Unsupervised Machine Learning**

- Introduction to Unsupervised Machine Learning
  - Association Rules
  - Cluster Analysis
  - Reinforcement Learning
  - K-Means Clustering
  - Principal and Independent Component Analysis
Books & References:


(5) EVALUATION METHODOLOGY:

- Mid-Term Exam: 30%
- Final Exam: 30%
- Assignments: 40%