# Course Name: Machine Learning
# Course Code: BCSE3066

**Unit I: Introduction** **6 lecture hours**

Introduction of Machine Learning. Types of Machine Learning: Supervised, Semi-supervised and Unsupervised Machine Learning. Applications of ML. Uderstanding of Datasets: Features selection, Traing and Test Datasets. Basics Mathematics: Matrix Operations, Differential Equation, Gradient Descent. Graphs: Linear and Non-linear, Contour graph, Sigmoid Function.

**Unit II: Supervised Learning Algorithms** **11 lecture hours**

Classification: Logistics Classification, Decision trees, Naive Bayes Classifiers, k-Nearest Neighbor, Support Vector Machines. Regression: Linear Regression, Cost Function, Gradient Descent for Linear Regression, Linear Regression with Multiple variables: Multiple Features, Gradient Descent for multiple variables, Polynomial Regression, Normal Equation. Overfitting and Underfitting.

**Unit III: Unsupervised Learning Algorithms** **10 lecture hours**

Unsupervised learning: Clustering Algorithms: k-Means clustering, Hierarchical Clustering, Probabilistic Clustering, Dimensionality Reduction, Feature Extraction and Manifold Learning.

**Unit IV: Neural Networks** **9 lecture hours**

Neural Networks:Representation, Artificial Neural Networks(ANN), Deep Neural Network, Bias, Activation Function: Sigmoid Activation Function, tanh, ReLU and Leaky ReLU. Distribution of data for improving accuracy. Bias and Variance. Forward and Backward propogation. Regularization for Neural Networks, Data Augmentation. Normalization of Datasets. Convolutional Neural Networks(CNN). Recurrent Neural Networks(RNN), Sequence Models.

**Unit V: Reinforcement learning and Recommendation System** **4 lecture hours**

Reinforcement learning: Positive Reinforcemen, Negative Reinforcement, Applications.
Reommendation system: Content-based methods and Collaborative Filtering Methods. Case studies of Recommendation Systems: Google Search, Amazon, Netflix, IMDb, YouTube and etc.