COURSE CODE:	ENS-449		
COURSE NAME:	Machine Learning		
CREDIT HOURS:	Theory = 02	Practical = 01	Total = 03
CONTACT HOURS:	Theory = 32	Practical = 48	Total = 80
PREREQUISITE:	None		
MODE OF TEACHING:	Instruction: 2 hours of Lecture per week (67%) Lab Demonstration: 3 hours of Lab work per week (33%)		

Course Description:

To provide students with an understanding of three main areas of machine learning: (1) supervised learning, (2) unsupervised learning, and (3) reinforcement learning. Topics covered will include linear regression, classification, support vector machines, artificial neural networks, model selection, ensemble methods, clustering, Expectation maximization, component analysis.

TOPICS COVERED:

Week#	Topics
1	Linear regression in one variable
2	Linear regression in multiple variable
3	Logistic Regression
4	Regularization
5	Regularization
6	Neural Network
7	Neural Network
8	Bias-Variance Tradeoff
9	**Midterm Exam – MSE**
10	Deep Neural Network
11	Deep Neural Network
12	Deep Neural Network
13	Unsupervised Learning

14	Unsupervised Learning
15	Unsupervised Learning
16	Group project
17	Group project
18	**End Semester Exam**

Lab Work:

Week#	**Topics**
1	Intro to Software
2	Decision Tree Classifier on UCI dataset
3	kNN and Naïve Bayes classifier
4	Linear Regression in One Variable
5	Linear Regression in Multiple Variables
6	Logistic Regression
7	Regularization and optimization methods
8	Regularization and optimization methods
9	**Midterm Exam – MSE**
10	Ensemble Methods
11	Deep Neural Network with PyTorch
12	CNN classifier with PyTorch
13	CNN classifier with PyTorch
14	LSTM classifier with PyTorch
15	LSTM classifier with PyTorch
16-17	Unsupervised Learning
18	**End Semester Exam**

Tools / Software Requirement: Python

Text and Material:

1. Machine Learning for Absolute Beginners: A Plain English Introduction (Third Edition) by Oliver Theobald, 2021
2. Trevor Hastie, Robert Tibshirani and Jerome Friedman, The Elements of Statistical Learning. Springer.
3. Richard Sutton and Andrew Barto, Reinforcement Learning: An introduction, 2nd edition, MIT Press, 2018
4. http://www.cs.cmu.edu/~mgormley/courses/10601/schedule.html
5. http://ciml.info/
6. http://cs229.stanford.edu
7. http://www.robots.ox.ac.uk/~az/lectures/ml/
8. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2010/demonstrations/
9. http://web.stanford.edu/class/stats202/content/viewhw.html?hw4
10. http://www.cs.cmu.edu/~tom/mlbook-chapter-slides.html
11. https://end-to-end-machine-learning.teachable.com/p/how-deep-neural-networks-work

ASSESMENT SYSTEM:

Theoretical/Instruction	**100%**
Assignments	10%
Quizzes	15%
Mid Semester Exam	25%
End Semester Exam	50%

Practical Work	**100%**
Lab Work	70%
Lab Exam/Projects	30%