

1.	Title of the course	Machine Learning in Process Engineering
2.	Course number	CH524L
3.	Structure of credits (L-T-P-C)	3-0-0-3
4.	New course/modification to	Modified with CH510L/MACHINE LEARNING IN PROCESS ENGINEERING
5.	To be offered by	Chemical Engineering
6.	Proposed by	M Nabil
7.	Prerequisite	CoT
8.	Course Objective(s): To introduce machine learning principles for process data analytics, discuss unsupervised and supervised learning models and demonstrate their uses in process engineering applications.	
9.	Course Content: Basics of data analytics; Process data and its challenges; Data preprocessing; Data visualization; Unsupervised learning: cluster analysis, k-means, hierarchical clustering, principal component analysis - probabilistic variants, isomap, manifold learning; Applications: fault detection, model identification; Importance of domain knowledge, model interpretability; Supervised learning: regression and classification, kernel methods, support vector machines, decision trees, neural networks, Gaussian processes, hidden Markov models, model assessment and selection; Applications: soft sensing, process monitoring, fault classification, image processing.	
10.	Textbook(s): 1. Hastie T, Tibshirani R and Friedman J, The Elements of Statistical Learning: Data Mining, Inference, and Prediction, 2nd Edition, Springer (2009). 2. Murphy K P, Machine Learning: A Probabilistic Perspective, The MIT Press (2012).	
11.	Reference(s): 1. Bishop C M, Pattern Recognition and Machine Learning, Springer (2006). 2. Mavrovouniotis M L, Artificial Intelligence in Process Engineering, Academic Press (1990).	