

Branch Name:	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Program Code:	ET114
Course Title:	Machine Learning Engineering
Course Code:	1ET1140201T
Pre-requisite Course:	Basic knowledge of mathematics and programming

Course Objectives:

1. To introduce students to the fundamental concepts, types, ethical implications, and overall workflow of Machine Learning, enabling them to understand the role and structure of ML systems.
2. To develop the ability to build and interpret regression and classification models using various supervised learning algorithms and evaluation metrics.
3. To enable students to discover patterns in unlabeled data using clustering methods and reduce feature dimensionality for analysis and visualization.
4. To introduce advanced ML paradigms such as ensemble models, neural network architecture, and reinforcement learning fundamentals.
5. To equip students with advanced skills in evaluation, optimizing, and selectness ML models while understanding modern concepts such as transfer learning, meta-learning, and adversarial robustness.

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Course Contents:

Unit No	Topic	Total Hours	Weightage (%)
1	Introduction to Machine Learning: Introduction and Motivation, Evolution of Machine Learning, Foundational Concepts, Assessing Learning Success, Machine Learning Pipeline, Overview of Machine Learning Methods	8	20
2	Supervised Learning: Fundamentals, Regression, Classification, Advanced Classification Techniques	7	15
3	Unsupervised Learning: Fundamentals, Clustering Techniques, Cluster Evaluation, Dimensionality Reduction, Advanced Clustering Methods	8	15
4	Advanced Topics in Machine Learning: Ensemble Learning Methods, Deep Learning, Reinforcement Learning, Model Interpretability	8	20
5	Model Evaluation and Selection: Model Evaluation Metrics, Cluster Validation Measures, Regression Model Assessment, Hyperparameter Tuning and Optimization	8	15
6	Advanced Concepts and Applications: Transfer Learning and Domain Adaptation, Meta-Learning, Adversarial Machine Learning, Fairness, Accountability, and Transparency	6	15

Reference Books:

1. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly Media.
2. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer.
3. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning, MIT Press.
4. Sebastian Raschka and Vahid Mirjalili, Python Machine Learning, Packt Publishing.
5. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press.
6. Andreas C. Müller and Sarah Guido, Introduction to Machine Learning with Python, O'Reilly Media.
7. Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An Introduction, MIT Press.

Course Learning Outcomes (CLO): At the end of the course, the students will be able to:

Sr No.	CLO	Description	Bloom's Taxonomy Level
1	CLO1	Students will be able to explain core AI foundations and apply logical reasoning and knowledge-based inference techniques to simple AI problems.	Understand (2)
2	CLO2	Students will be able to construct and analyze Bayesian models, perform inference, and apply probabilistic methods to uncertain decision-making scenarios.	Apply (3)
3	CLO3	Students will be able to apply evolutionary strategies, genetic algorithms, and genetic programming to optimize solutions across varied problem domains.	Apply (3)
4	CLO4	Students will be able to select, implement, and evaluate appropriate ML models—including regression, classification, clustering, and dimensionality reduction techniques—based on problem requirements.	Evaluate (5)
5	CLO5	Students will be able to implement basic neural and deep learning models, apply NLP methods, interpret generative techniques such as GANs/VAEs, and evaluate ethical implications in AI systems.	Evaluate (5)

L1- Remember, L2- Understand, L3- Apply, L4- Analyze, L5- Evaluate, L6- Create

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO3
CLO1	H	H	M	M	L	L	L	M	L	M		M	H	M	H
CLO2	H	H	M	H	M		L	M	L	M			H	H	H
CLO3	H				M				L	M				H	H
CLO4			H	H	H		L		M			H		H	H
CLO5	H		H	H	H	M	M	H	M			H	H	H	H
CLO6	M	L	L	L	L	H	H	M	L	M		M	L	M	M

H: High, M: Medium, L: Low. PO/PSO mapping is not specified in the source syllabus.