	General Sir John Kotelawala Defence University Faculty of Engineering Electronic and Telecommunication Engineering Degree Program **Module Descriptor**

Module Code	**ET 4103**	Module Title	**Machine Learning**				
Credits	**3**	Hours pers Semester (Notional)	Lectures	34	Evaluation (%)	EA	-
GPA/NGPA	GPA		Tutorials	12		CA	100
C/E/O	C		Labs	10	Prerequisites/ Co-requisite	-	
Semester	7		Other Learning Activities	-			
			Independent Learning and Assessments	94			

C- Compulsory, E- Elective, O- Optional, GPA- Grade Point Average, EA -End Semester Assessment, CA: Continuous Assessment

Module Objective

To provide the students with the knowledge on applying machine learning techniques to identified engineering problems.

Learning Outcomes

After the successful completion of this module, the learner should be able to:

LO1:   Compare and contrast machine learning techniques.
LO2:   Solve a problem in linear regression.
LO3:   Solve a problem in logistic regression.
LO4:   Solve a problem in support vector machine.
LO5:   Solve a problem in K-means algorithm.
LO6:   Design a system using reinforcement learning.

Content	Hours			
	L	**T**	**LB**	**O**
Introduction to machine learning [LO1, LO2] Techniques of machine learning, supervised learning, machine learning process, statistical mathematic preliminaries	8	3	2	-
Linear Regression with single variable [LO1, LO2] Modal representation, Hypothesis function, cost function, gradient decent **Linear Regression with multiple variables** cost function, gradient decent, feature normalization	6	2	2	-
Logistic Regression [LO3] Binary classification, Decision boundary, Optimization, regularized logistic regression	6	2	2	-
Support Vector Machine (SVM) [LO4] Kernals, Choosing SVM parameters, Applying SVM, Multi class classifiers.	3	1	1	-
Unsupervised Learning [LO5] – K- means algorithm Optimization objective, Choosing the number of clusters, Dimensionality Reduction	3	1	1	-
Reinforcement Learning [LO6] Markov Decision Process, value function, Temporal Difference learning, Q-learning	8	3	2	-
Active Hours (AH) = 34 + 12/2 + 10/2 = 45	34	12	10	-

Notations: L-Lecture,   T- Tutorial,   LB-Practical, O-Other (Specify)*

Course Assessment / Evaluation

LO	Per Unit Weight of LO	Continuous Assessment (CA)		End Semester Assessment (EA) Marks	Total Marks Out of 100
		Lab/Field Assessment Marks	Other Continuous Assessment Marks		
LO1	0.05	5 (LAB1)	-	-	05
LO2	0.15	5 (LAB2)	10 (CA1)	-	15
LO3	0.15	5 (LAB3)	10 (CA2)	-	15
LO4	0.30	5 (LAB4)	25 (CA3)	-	30
LO5	0.05	5 (LAB5)	-	-	05
LO6	0.30	5 (LAB6)	25 (CA4)	-	30
Total Marks		100 Marks		0 Marks	100 Marks

Lab/Field work Details

LAB1	Model training using Linear Regression with single variable
LAB2	Model training using Linear Regression with multiple variables
LAB3	Model training using Logistic Regression
LAB4	Model training using Support Vector Machine
LAB5	Model training using Unsupervised Learning
LAB6	Model training using Reinforcement Learning

Lab/Field work Details

CA1	Assignment on devise of Linear Regression
CA2	Assignment on devise of Logistic Regression
CA3	Assignment on devise of SVM/ Dimension Reduction
CA4	Assignment on devise of Reinforcement Learning

LO-PO Mapping

Learning Outcome	Per unit weight	Program Outcome										
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
LO1	0.10	M	M	M	-	M	-	-	-	-	-	M
LO2	0.15	M	M	M	-	M	-	-	-	-	-	M
LO3	0.15	M	M	M	-	M	-	-	-	-	-	M
LO4	0.15	M	M	M	-	M	-	-	-	-	-	M
LO5	0.15	M	M	M	-	M	-	-	-	-	-	M
LO6	0.30	H	H	H	-	M	-	-	-	-	-	M
Module	1.00	H	H	H	-	M	-	-	-	-	-	M

Recommended Reading

[1]   Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
[2]   Prince S. J. D., "Understanding Deep Learning", The MIT Press, 2023.