Module Code	DA2111	Semester 4	Module Title	Statistical & Machine Learning					
Credits	3	Hours/Week			C	E	O	Evaluation %	Prerequisites
GPA/NGPA	GPA	Lectures	Lab / Tutorials	Self-study				CA / WE	DA1121, DA2421
		2	2	6				100 / -	
Module Aim:	This course aims to provide theoretical and practical aspects of statistical and machine learning techniques for business analytics.								

Learning Outcomes

After completing this module, the students should be able to:

LO-1	Describe the fundamental concepts in problem-solving with intelligent systems
LO-2	Explain the mathematical basis for the techniques used in statistical and machine learning
LO-3	Apply the appropriate computational intelligence techniques for a given problem
LO-4	Make use of machine learning tools in software to solve business-related problems

Syllabus Outline		Learning Outcomes
1	Introduction to Statistical Machine Learning [6 hrs] Empirical Risk Minimization, Bayes Optimal classifier, PAC learnability, Uniform Convergence, VC dimensions	LO-1, LO-2
2	Supervised Learning Algorithms I: Regression Algorithms [7 hrs] *Review of Linear Regression, Model Selection and Regularization (Subset Selection, Stepwise Selection, Ridge Regression, LASSO), Model Comparisons*	LO-1, LO-3, LO-4
3	Supervised Learning Algorithms II: Classification [6 hrs] *Logistic Regression (Binary, Multi-Class), Naive Bayes, KNN, Linear and Quadratic Discriminant Analysis, Decision Trees, Support Vector Machine*	LO-1, LO-3, LO-4
4	Supervised Learning Algorithms III: Ensemble Techniques [6 hrs] *Bagging (Random Forests), Boosting (Gradient Tree Boosting, ADA Boost)*	LO-1, LO-3, LO-4
5	Model Testing, Evaluation and Validation [6 hrs] *Overfitting and Underfitting, Bias-Variance Trade-off, Errors in Estimation (Training vs Test MSE, Mean Absolute Error, Root Mean Squared Error), Confusion Matrix, Sensitivity and Specificity, ROC Curve, Validation test Split, Cross validation*	LO-1, LO-2, LO-3
6	Unsupervised Learning Algorithms [12 hrs] *Clustering, Dimensionality Reduction, Principal Component Analysis, Singular Value Decomposition*	LO-1, LO-3, LO-4

Assessments

Assessment		Weight	Learning outcomes
Continuous Assessments (CA)	Group Assessment – 01 (Take home)	40% [3 hrs]	LO-1, LO-2
	Individual Assessment – 01 (Take home)	30% [3 hrs]	LO-2, LO-3, LO-4
	Lab practical test - 01	30% [2 hrs]	LO-1, LO-2, LO-3, LO-4

References