9. Objective: To equip with basic mathematical and statistical techniques commonly used in pattern recognition. Also provide with an adequate background on probability theory, statistics, and optimization theory to tackle a wide spectrum of engineering problems.

10. Details of Course

S.No.	Contents	Contact Hours
1.	**Introduction** to Pattern Recognition, Feature Detection, Classification, Review of Probability Theory, Conditional Probability and Bayes Rule, Random Vectors, Expectation, Correlation, Covariance, Review of Linear Algebra, Basics of Estimation theory, Decision Boundaries, Decision region / Metric spaces/ distances.	10
2.	**Classification:** Bayes decision rule, Error probability, Normal Distribution, Discriminant functions, Decision surfaces, K-NN Classifier, Single Layer Perceptron, Multi-Layer Perceptron, Training set, test set; standardization and normalization.	8
3.	**Clustering:** Basics of Clustering; similarity / dissimilarity measures; clustering criteria, Different distance functions and similarity measures, Minimum within cluster distance criterion, K-means algorithm, K-medoids, DBSCAN, Data sets - Visualization; Unique Clustering, No existence of clusters.	8
4.	**Feature selection:** Problem statement and Uses; Algorithms - Branch and bound algorithm, sequential forward / backward selection algorithms, (l,r) algorithm; Probabilistic separability based criterion functions, interclass distance based criterion functions.	8
5.	**Feature extraction:** PCA, Structural PR, SVMs, FCM, Soft-computing and Neuro-fuzzy techniques, and real-life examples.	8
	TOTAL	42

11. Suggested Books

S. No.	Name of Books / Authors/ Publishers,/ Year of Publication/Reprint
Text Books	
1.	R. O. Duda, P. Hart, D. Stork, Pattern Classification, 2nd Ed. Wiley, ISBN: 978-0-471-05669-0.,2000
2.	Bishop, C. M., Pattern Recognition and Machine Learning. Springer, ISBN 978-0-387-31073-2,2007
3.	Bishop, C. M., Neural Networks for Pattern Recognition, Oxford University Press, ISBN-13: 978-0198538646,1995
Reference Books	
1.	Theodoridis, S. and Koutroumbas, K., Pattern Recognition, 4th Ed. Academic Press,SBN :9781597492720.,2008
2.	Hastie, T., Tibshirani, R. and Friedman, J., The Elements of Statistical Learning, Springer, ISBN:9780387848570.,2009