Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1	Introduction	Introduction of AI, introduction of Machine Learning, Significance of AI and ML, Application areas, model pipelining	3
2	Mathematical Formulation	Matrices and its operations, Overview of probability theory, Bayes networks, Independece, I-Maps, Undirected graphical models, Bayesian and Markov networks	5
3	Models and Learning	Learning, Types of learning, Local models; Exact inference, Clique trees, Belief propagation, Tree construction, applications solving problems	6
4	Optimization and Inference	Introduction to optimization, Approximate inference: sampling, Markov chains, MAP inference, Inference in temporal models; Learning graphical models	6
5	Estimation	Parameter estimation, Bayesian networks and shared parameters, structure learning, Partially observed data, Dimension reduction: PCA, LDA	8
6	Decision making	Gradient descent, Expected Maximization, Hidden variables, HMM, Undirected models, Undirected structure learning, Causalty, Utility functions, Decision problem, Expected utility	8
7	Classification and Segmentation	KNN, SVM, NN and its types, K-means, FCM, Introduction to Deep learning for classification and segmentation	6
Total number of Lectures			**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	Attendance (15Marks), Assignment/Quiz/Mini-project (10Marks)
Total	**100**

Project based learning: Each student in a group of 2-3 will extract data from real-world domains using data from standard repositories that are globally recognized. For conducting application-based

research, the students are encouraged to analyze social/political/financial/disease related data and generate underlying networked structure based on the algorithms of AI.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Michael Negnevitsky, *Artificial Intelligence*, Person Publication, Third Edition, 2011
2.	Toshinori Munakata, *Fundamentals of the New Artificial Intelligence*, Springer, Second Edition, 2008
3.	Deisenroth, Marc Peter, A. Aldo Faisal, and Cheng Soon Ong. *Mathematics for machine learning*. Cambridge University Press, 2020
4.	Valliappa Lakshmanan, Martin Görner, Ryan Gillard - *Practical Machine Learning for Computer Vision_ End-to-End Machine Learning for Images*, O'Reilly Media, Inc., 2021
5.	Laurence Moroney - *AI and Machine Learning for On-Device Development_ A Programmer's Guide*, O'Reilly Media, Inc., 2021