भारतीय प्रौद्योगिकी संस्थान जम्मू
INDIAN INSTITUTE OF TECHNOLOGY JAMMU
विद्यायामं सर्वयत्न प्रधानम्

भारतीय प्रौद्योगिकी संस्थान जम्मू
जगती, पी.ओ. नगरोटा, एन एच - 44, जम्मू -181221, जम्मू और कश्मीर
Indian Institute of Technology Jammu
Jagti, P. O. Nagrota, NH-44, Jammu -181 221, J & K, India

COURSE TEMPLATE

1.	Department proposing the course	**Electrical Engineering**		
2.	Course Title	**Machine Learning**		
3.	L-T-P structure	**L - 3.00 T - 0.00 P - 0.00**		
4.	Credits	**3.00**	Is this a Credit Earning Course	**Credit Earning Course**
5.	Course Number			
7.	Pre-requisite(s)	**No**		
8.	Frequency of Offering	**Once in every year**		
9.	List of faculty who can teach the course	**Karan Nathwani (IITJMU11009)**		
10.	Course Instructor	**Karan Nathwani (IITJMU11009)**		
11.	Will the course require any visiting faculty/external expert?	**No**		
12.	Course objectives (about 100 words): **Machine learning is a field of scientific study concerned with algorithmic techniques that enable machines to learn performance on a given task via the discovery of patterns or regularities in exemplary data. Consequently, its methods commonly draw upon a statistical basis in conjunction with the computational capabilities of modern computing hardware. This course aims to acquaint the student with the main branches of machine learning and provide a thorough introduction to the most widely used approaches and methods in this field.**			
13.	Course outcomes (about 100 words): **By the end of this course, students should:** **Know different machine learning model classes.** **Comprehend the difference between supervised, unsupervised, and reinforcement learning methods.** **Understand common machine learning models.** **Analyze trade-offs in the application of different models.** **Appropriately choose machine learning models according to a given task.**			
14.	Course contents : **Bayes Decision Theory** **Parameter Estimation Methods** **Unsupervised learning and clustering** **Nonparametric techniques for density estimation** **Dimensionality reduction** **Linear discriminant functions** **Non-metric methods for pattern classification**			

15.	Detailed Contents	
Module No.	**Topic**	**No. Of Hours**
1	Introduction to machine learning. Classification: nearest neighbour, decision trees, perceptron, support vector machines, VC-dimension.	7.00
2	Regression: linear least squares regression, support vector regression. Additional learning problems: multiclass classification, ordinal regression, ranking.	7.00
3	Ensemble methods: boosting. Probabilistic models: classification, regression, mixture models (unconditional and conditional), parameter estimation, EM algorithm.	7.00
4	Learning and inference in Bayesian networks and MRFs: parameter estimation, exact inference (variable elimination, belief propagation), approximate inference (loopy belief propagation, sampling). Additional topics: semi-supervised learning, active learning, structured prediction.	8.00
5	Dimensionality reduction: Fisher discriminant analysis, Principal component analysis,	6.00
6	Linear discriminant functions: Gradient descent procedures, Perceptron, Support vector machines	4.00
7	Deep Learning: Introduction to Deep learning and Applications	3.00
	Total Lecture hours (14 times ‘L’)	42

16.	Brief description of tutorial activities:	
Module No.	**Topic**	**No. Of Hours**
	Total Tutorial hours (14 times ‘T’)	0

17.	Brief description of Practical / Practice activities :	
Module No.	**Topic**	**No. Of Hours**
	Total Practical / Practice hours (14 times ‘P’)	0

18.	Suggested texts and reference materials
Text Book	**Refernce Books**
C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006	S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009 R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001 Mitchell T, Machine Learning. McGraw Hill, 1997.

19.	Resources required for the course (itemized student access requirements, if any)	
Resources Required	**If Others, Please Specify**	**Remarks**