GUJARAT TECHNOLOGICAL UNIVERSITY

Minor Degree : Artificial Intelligence and Machine Learning
Subject Code: 114AG01
Semester – IV
Subject Name: Introduction to AI and Machine Learning

Prerequisite: Mathematics

Rationale: With increasing usage of Internet, the importance of Artificial Intelligence (AI) and Machine Learning (ML) can be seen in many areas which directly affect human life. Artificial Intelligence is the science and engineering which makes machines intelligent.

A subset of AI, Machine Learning (ML) is the area of Computational Science that focuses on analyzing and interpreting structures and patterns in data to enable learning, reasoning and decision making. The AI and ML technologies bring more complex data analysis features to existing applications, therefor students should learn various ML approaches to build new solutions for various real-life problems

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	0	30	0	100

Content:

Unit No	Course Content	No of Hours
1	Defining Artificial Intelligence, Defining AI techniques, Using Predicate Logic and Representing Knowledge as Rules, Representing simple facts in logic, Computable functions and predicates, Procedural vs Declarative knowledge, Logic Programming, Mathematical foundations: Matrix Theory and Statistics for Machine Learning.	12
2	Idea of Machines learning from data, Classification of problem –Regression and Classification, Supervised and Unsupervised learning.	8
3	Linear Regression: Model representation for single variable, Single variable Cost Function, Gradient Decent for Linear Regression, Gradient Decent in practice.	10
4	Logistic Regression: Classification, Hypothesis Representation, Decision Boundary, Cost function, Advanced Optimization, Multi-classification (One vs All), Problem of Overfitting.	7
5	Discussion on clustering algorithms and use-cases cantered around clustering and classification.	5
	Total Hrs.	**42**

Suggested Specification table (Theory):

Distribution of Theory Marks (%)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
15	20	25	20	10	10

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

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Reference Books:

1. Saroj Kaushik, Artificial Intelligence, Cengage Learning, 1st Edition 2011.
2. Anindita Das Bhattacharjee, "Practical Workbook Artificial Intelligence and Soft Computing for beginners, Shroff Publisher-X team Publisher.
3. Yuxi (Hayden) Liu, "Python Machine Learning by Example", Packet Publishing Limited, 2017.
4. Tom Mitchell, Machine Learning, McGraw Hill, 2017.
5. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer, 2011.
6. T. Hastie, R. Tibshirani, J. Friedman. The Elements of Statistical Learning, 2e, 2011.

Course Outcomes: Upon completion of this course students should be able to:

No	Course Outcomes	% weightage
01	Summarize knowledge, logic fundamentals and associate it with mathematical basics.	30
02	Examine and implement machine learning solutions to classification, regression	20
03	Evaluate and interpret the results of the different ML techniques.	20
04	Classify and analyze linear and logistic regression techniques.	15
05	Compare and Design various machine learning algorithms in a range of Real-world applications	15

List of Practical:

1. Implementation of logical rules in Python.
2. Using any data apply the concept of:
   - **a.** Liner regression
   - **b.** Gradient decent
   - **c.** Logistic regression
3. To add the missing value in any data set.
4. Perform and plot under fitting and overfitting in a data set
5. Implementation of clustering and classification algorithms.