



**SARVAJANIK UNIVERSITY**  
**Sarvajani College of Engineering and Technology**  
**Master of Computer Applications**



**MCA Semester III**

**Subject Name:** Machine Learning with Python

**Subject Code:** MTCA14312

**Type of course:** Professional Elective Course

**Prerequisite:** Basics of Computer Science including algorithms, Data Structure, Basic Linear Algebra, Probability Theory

**List of Courses where this course will be prerequisite:**

Deep Learning  
 Artificial Intelligence

**Rationale:** The nearly limitless quantity of available data, affordable data storage, and the growth of less expensive and more powerful processing has propelled the growth of deriving insights from it. Many industries are developing more robust Machine Learning models capable of analyzing bigger and more complex data while delivering faster, more accurate results on vast scales. Machine Learning tools enable organizations to more quickly identify profitable opportunities and potential risks.

**Teaching and Examination Scheme:**

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	4	5	60	25	15	60	40	200

**CA1:** Continuous Assessment (assignments/projects/open book tests/closed book tests) **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course



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**Content:**

<b>Sr. No.</b>	<b>Content</b>	<b>Teaching Hrs.</b>	<b>Module Weightage</b>
<b>1</b>	<b>Introduction to Machine Learning, Concept Learning and the General-to-specific Ordering</b>  Well-posed learning problems, Designing learning system, Perspectives and issues in Machine Learning, Concept Learning Talk, Concept Learning as Search, Inductive Bias	<b>5</b>	<b>10%</b>
<b>2</b>	<b>Decision Tree Learning</b>  Decision Tree representation, problems, Basic decision tree learning algorithm, Issues in Decision Tree Learning	<b>8</b>	<b>15%</b>
<b>3</b>	<b>Artificial Neural Network</b>  Biological Motivation, Neural Network Representations, Appropriate Problems for Neural Network Learning, Perceptron, Multilayer networks and Backpropagation Algorithm. Example on Face recognition problem	<b>11</b>	<b>25%</b>
<b>4</b>	<b>Evaluating Hypotheses</b>  Estimating Hypothesis Accuracy, Basics of Sampling Theory, General Approach for Deriving Confidence Intervals, Difference in Error of two Hypotheses, Comparing learning Algorithms	<b>9</b>	<b>20%</b>
<b>5</b>	<b>Bayesian Learning, Instance Based Learning and Support Vector Machines</b>  Bayes Theorem and concept learning, Maximum Likelihood and Least-Squared Error Hypotheses, Illustrative Example	<b>12</b>	<b>30%</b>



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	k-Nearest Neighbor Learning, Locally weighted Regression		
	Support Vector Machines		

**Suggested Specification table with Marks (Theory):**

<b>Distribution of Theory Marks</b>					
<b>R Level</b>	<b>U Level</b>	<b>A Level</b>	<b>N Level</b>	<b>E Level</b>	<b>C Level</b>
20	20	15	15	15	15

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

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Reference Books:**

<b>Sr. no.</b>	<b>Title of book /article</b>	<b>Author(s)</b>	<b>Publisher and details like ISBN</b>	<b>Year of publication</b>	<b>Publication Edition</b>
1	Machine Learning	Tom M Mitchell	McGraw Hill  ISBN:0-07-042807-7	1997	International Edition
2	Real-world Machine Learning	Henrik Brink, Joseph W. Richards, Mark Fetherolf	Dreamtech Press  ISBN: 978-93-5119-949-6	2018	1 <sup>st</sup> Edition



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3	Machine Learning	AnuradhaSriniv arasaraghavan	Wiley India  ISBN: 978812657 8511	2020	1 <sup>st</sup> Edition
4	Machine Learning	SaikatDutt, Subramanian Chandramouli, Amit Kumar Das	Pearson Education  ISBN: 978- 935306669 7	2018	1 <sup>st</sup> Edition

**Course Outcomes:**

Sr. No.	CO Statement  After learning this subject, students will be able to	Marks % weightage
CO-1	Gain knowledge about basic concepts of Machine Learning	10
CO-2	Analyze the use of decision trees for classification problems	15
CO-3	Understand the practical methods for concept learning, real-valued and vector-valued functions with use Artificial Neural Network	25
CO-4	Learn to evaluate the accuracy of hypotheses for machine learning	20
CO-5	Learn to use Bayes Theorem for probabilistic machine learning problems	15
CO-6	Implement Support Vector Machines for classification and regression problems	15



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**Mapping with POs: (0 to 3)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO-1	3	3	1	3	2	1	0	0	3	1	1	3			
CO-2	3	3	1	3	2	1	0	0	3	1	1	3			
CO-3	3	3	1	3	2	1	0	0	3	1	1	3			
CO-4	3	3	1	3	2	1	0	0	3	1	1	3			
CO-5	3	3	1	3	2	1	0	0	3	1	1	3			
CO-6	3	3	1	3	2	1	0	0	3	1	1	3			
Ratio nale*															

**Rationale\*:** Explaining why it is matching this particular program outcome

**List of Open learning website:**

- <https://machinelearningmastery.com/start-here/>
- <https://ai.google/education/>
- <https://www.youtube.com/watch?v=9f-GarcDY58>
- <https://www.edx.org/professional-certificate/harvardx-data-science>
- <https://www.edx.org/course/data-science-machine-learning>
- <https://www.edx.org/learn/machine-learning>

**List of Open Source Software:**

- Anaconda Navigator
- Jupyter Notebook
- Google Colab



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- VSCode
- PyCharm Community Edition

**FOR LAB SESSIONS:**

**List of Experiments:**

Practical will be performed using the PYTHON Programming language.

Consider following datasets available from UCI Learning Repository (<https://archive.ics.uci.edu/> )

1. Abalone
2. Adult
3. Auto MPG
4. Breast Cancer
5. Heart Disease
6. Wine
7. KDD Cup
8. Iris

The student may use any of the datasets mentioned above to implement following programs.

The Teacher may emphasize using more than one datasets to check how the algorithm behaves in case of different datasets.

Sr. No.	Problem Statements
1	Explore various datasets. Identify the qualitative and quantitative attributes. Also figure out the shape of the dataset.
2	Implement Decision Tree and identify the root node and the subpart/child nodes.
3	Compare the accuracy measures that are computed for various datasets using the Decision Tree algorithm. Prune the tree and check the results. Justify your rationale.
4	Implement K-Nearest Neighbor.
5	Compare the accuracy measures that are computed for various datasets using k-Nearest Neighbor algorithm. Check your output by finding the optimal value of k. Justify your rationale.



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6	Implement Naïve-Bayes Algorithm for classification problems.
7	Implement Support Vector machines for classification problems
8	Explore the Neural Network Playground on <a href="https://playground.tensorflow.org/">https://playground.tensorflow.org/</a>
9	Implement text classification using neural network in python on Twenty Newsgroup dataset from UCI machine learning repository.
10	Perform comparative analysis of Decision Tree, k-Nearest Neighbor, Support Vector Machines and ANN algorithms on Iris and Abalone dataset.

**Major Equipment Needed:**

No explicit software required. Practical can be done using simple GEdit software available on Ubuntu. Required libraries can be installed as and when required.