Name of Institute: **INSTITUTE OF TECHNOLOGY & ENGINEERING**
Name of Faculty: **Prof. Sejal Thakkar.**

Course code:
Course name: **Machine Learning**
Pre-requisites: NIL
Credit points: 4
Offered Semester: III

Course Coordinator
Full Name: Sejal Thakkar
Department with siting location: Computer Engineering (4rd floor,Faculty room, Bhanwar building)
Telephone: 9033380982,7990552332
Email: sejalthakkar.ce@indusuni.ac.in
Consultation times: Wednesday (4:00 PM to 5:00 PM)

Students will be contacted throughout the Session via Mail with important information relating to this Course.

Course Objectives
By participating in and understanding all facets of this Course a student will:

1. Understand the key algorithms and theory that form the foundation of Machine Learning.
2. Understand a wide variety of learning algorithms.
3. Recognize the characteristics of machine learning that make it useful to real-world problems.
4. Understand how to perform evaluation of learning algorithms and model selection.
5. Develop skills of using recent machine learning software in order to solve practical problems.
6. Understand and learn state of the art machine learning techniques to provide employability in industry.

Course Outcomes (CO)
After successful completion of the course, student will able:

1. Get exposure of machine learning concepts and range of problems that can be handled by machine learning
2. Compare and parameterize different learning algorithms
3. Apply the machine learning concepts in real life problems

4. Understand learning in machines with different techniques
5. Understand and apply various recognition techniques.
6. Learn about parameter selection and feature extraction. Compare and parameterize different learning algorithms
7. Learn comparison of various algorithms

Course Outline

CNN, ANN, Regression, Classification

Method of delivery

1. Chalk & Talk
2. PPT presentation

Study time

3 lectures per week
2 hour labs per week

CO-PO Mapping (PO: Program Outcomes)

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	√	√	√								√	√	√	√	√
CO2		√	√	√	√	√			√	√			√	√	√
CO3	√	√	√	√	√	√	√				√	√	√	√	√
CO4	√	√	√	√	√						√		√	√	√
CO5	√	√	√									√	√	√	√
CO6			√	√	√								√	√	√
CO7	√	√	√	√	√			√	√				√	√	√

Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

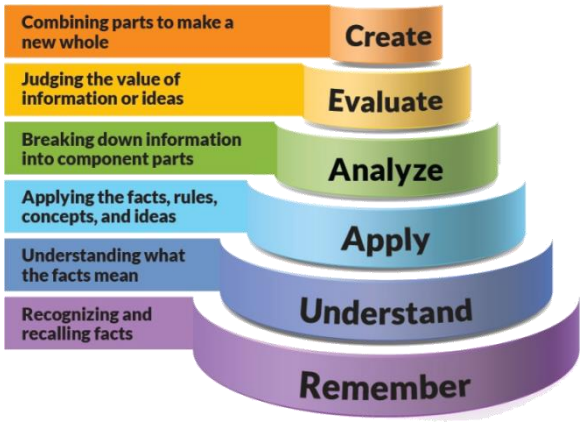

Figure 1: Blooms Taxonomy

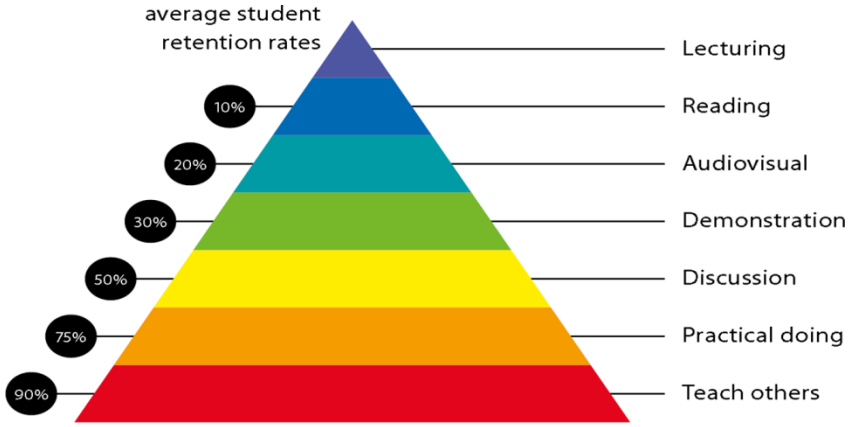

Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____Graduate Capabilities
Informed Have a sound knowledge of an area of study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	**1 Professional knowledge, grounding & awareness**
Independent learners Engage with new ideas and ways of thinking and critically analyze issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of sources and technologies.	**2 Information literacy, gathering & processing**

Acknowledge the work and ideas of others.	
Problem solvers Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	**4 Problem solving skills**
Effective communicators Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	**5 Written communication** **6 Oral communication** **7 Teamwork**
Responsible Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.	**10 Sustainability, societal & environmental impact**

Practical work:

(Mention what practical work this Course involves)
As a part of practical, student have to perform various Python in machine learning project relevant activities.

Lecture/tutorial times

(Give lecture times in the format below)

For 3 Sem IT A and B

Monday: 11 AM to 12 PM: Lecture
Monday: 2 PM to 4: 10 PM: Laboratory
Tuesday: 11:10 AM to 12:10 PM: Lecture
Wednesday: 11:10 AM to 12:10 PM: Lecture
Friday: 2 PM to 4:10 PM: Laboratory

Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the Course outline. Minimum

attendance requirement as per university norms is compulsory for being eligible for mid and end semester examinations.

Details of referencing system to be used in written work

Text books

Text Book :

1. Compare and parameterize different learning algorithms
2. Compare and parameterize different learning algorithms

Additional Materials

Reference Book:

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

Example:

Theory:

Internal evaluation	**20%** Objective (1-3-4)	
10 marks as attendance 5 bonus for all students having attendance > 80%		
10 marks for assignment or case studies, limited to minimum 02 assignments per course		
Mid semester	40% (due week 10)	Objectives (2-5)
Final exam (*closed book*)	40%	Objectives (1-5)

Practical:
20% for Internal Project
20% Lab file
20% Research related activities/Presentations
40% end semester project exam +Viva

SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in mid semester or end semester will be considered for supplementary assessment in the respective components (i.e mid semester or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (mid semester or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

Practical Work Report/Laboratory Report:

A report on the practical work is due the subsequent week after completion of the class by each group.

Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

University and Faculty Policies

Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

Plagiarism - Plagiarism is not acceptable and may result in the imposition of severe penalties. Plagiarism is the use of another person's work, or idea, as if it is his or her own - if you have any doubts at all on what constitutes plagiarism, please consult your Course coordinator or lecturer. Plagiarism will be penalized severely.

Do not copy the work of other students.
Do not share your work with other students (except where required for a group activity or assessment)

.

Course schedule (subject to change)

(Mention quiz, assignment submission, breaks etc as well in the table under the Teaching Learning Activity Column)

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Weeks 1	Introduction Learning Problems, designing a learning system, Issues with machine learning. Concept Learning, Version Spaces and Candidate Eliminations.	CO1	
	Weeks 2	Inductivebias, Supervised/Unsupervised Learning, Loss functions and generalization, Parametric vs Non-parametric methods, Evaluating Machine Learning algorithms and Model Selection	CO1, CO2	
	Week 3	Introduction to Statistical Learning Theory, Ensemble Methods, Bagging, Boosting, Random Forest	CO4	
	Week 4	Supervised Learning Regression/Classification) Basic methods: Distance-based methods, Nearest-Neighbors, Decision Trees, Naive Bayes, Linear models: Linear Regression, Logistic Regression, Generalized Linear Models.	CO3,CO4,CO5	
	Week 5	Support Vector Machines, Nonlinearity and Kernel Methods, Beyond Binary Classification: Multi-class/Structured Outputs, Ranking Unsupervised Learning Clustering: K-means/Kernel K-means, Dimensionality Reduction -PCA, CCA, LDA, ICA, MNF	CO4,CO5	

	Week 6	Canonical Variates - Feature Selection vs Feature Extraction, Generative Models (mixture models and latent factor models)	CO5	
	Week 7	Bayesian Learning Bayes Theorem, Bayes Theorem and Concept Learning, Maximum Likelihood and Least squared Error Hypothesis, Maximum likelihood hypothesis for Predicting Probabilities.	CO2,CO3,CO5	
	Week 8	Minimum Description Length, Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes, Classifier.	CO4, CO6	
	Week 9	Bayesian Belief Network, EM Algorithm, Case Study: Learning to classify text.	CO5	
	Week 10	Artificial Neural networks Neural Network Representation, Appropriate problems for Neural Network Learning, Perceptron, Multilayer Networks and Back Propagation,	CO2, CO3, CO5, CO7	
	Week 11	Algorithms, Remarks on Back Propagation Algorithms, Case Study: face Recognition Advanced topics Semi-supervised,ActiveLearning, Reinforcement Learning,	CO2, CO5, CO7	
	Week 12	Recent trends in various learning techniques of machine learning and classification methods, Overview of typical application areas, such as Recommender System.	CO2, CO5, CO7	

COMPUTER ENGINEERING DEPARTMENT COURSE DEPENDANCY CHART