

**Course Handout**

Institute/School Name	Chitkara University Institute of Engineering & Technology		
Department Name	Department of Computer Science & Engineering		
Programme Name	Bachelor of Engineering-Computer Science & Engineering ( <b>Artificial Intelligence and Machine Learning</b> )		
Course Name	Supervised and Unsupervised Learning	Session	Jan-June, 2026
Course Code	24CAI0203	Semester/Batch	4 <sup>th</sup> /2024
L-T-P (Per Week)	2-0-4	Course Credits	4
Pre-requisite	Knowledge of statistics, programming (preferably Python)	NHEQF Level	5
Course Coordinator	Dr. Harjeet Singh	SDG Number	4, 9

**1. Objectives of the Course**

The course *Supervised and Unsupervised Learning* aims to provide a strong foundation in the principles and techniques of machine learning. Students will learn to develop predictive models using supervised learning algorithms such as regression, classification, and ensemble methods, as well as uncover patterns and insights from unlabeled data using unsupervised learning techniques like clustering and dimensionality reduction. The course emphasizes both theoretical understanding and practical implementation, enabling students to preprocess data, select appropriate models, evaluate performance, and apply these methods to real-world problems. By the end of the course, students will be equipped to analyze datasets effectively, solve computational problems, and make informed decisions using machine learning approaches.

The main objectives of the course are to:

- Implement Supervised and Unsupervised Learning algorithms to make predictions.
- Use Regression and Classification algorithms for predicting continuous and discrete values.
- Learn best practices for real world data sets.
- Learn how to use sklearn library for pre-processing the data.
- Understand important concepts which helps to improve model.
- Understand the full product workflow for the machine learning lifecycle.

**2. Course Learning Outcomes (CLOs)**

On completion of the course, students should be able to:

Course Learning Outcomes	CLOs	Program Outcomes (PO)	NHEQF Level Descriptor	No. of Lectures
<b>CLO1</b>	Analyze fundamental machine learning concepts and tools to determine their practical application across diverse problem domains.	PO1, PO2, PO3, PO4, PO5, PO6	Q1, Q2	4
<b>CLO2</b>	Transform raw datasets into high-quality inputs for machine learning tasks through rigorous preprocessing, missing-value imputation, and feature optimization.	PO1, PO2, PO3, PO4, PO5, PO6	Q3, Q6	10

<b>CLO3</b>	Become proficient in using popular ML libraries and frameworks such as sklearn to build ML models.	PO1, PO2, PO3, PO4, PO5, PO6	Q2, Q3	16
<b>CLO4</b>	Evaluate machine learning model performance using standardized metrics and systematic hyperparameter tuning to ensure optimal model selection.	PO1, PO2, PO3, PO4, PO5, PO6	Q1, Q2	16
<b>CLO5</b>	Assess the societal impact of machine learning by identifying and mitigating issues related to algorithmic bias, privacy, and transparency.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Q6	14
<b>Total Contact Hours</b>				<b>60</b>

**CLO-PO-PSO Mapping grid |Program Outcomes (POs) and Program Specific Outcomes (PSO) are available as a part of Academic Program Guide**

CLO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	Type of Assessment
CLO01	H	M	L	M	L	L						M		M	Formative /Summative
CLO02	H	L	M	M	H	M							M	H	Formative /Summative
CLO03	H	L	L	M	H	M							H	M	Formative /Summative
CLO04	H	M	M	M	H	M						H			Formative /Summative
CLO05	H	H	M	M	M	H	L	H	M			H	L	H	Formative /Summative

\*H=High,M=Medium,L=Low

### 3. Recommended Books:

**B01:** "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien (2nd edition)

**B02:** Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville (2nd edition)

**B03:** Introduction to Machine Learning" by Alpaydin (4th edition)

**B04:** The Elements of Statistical Learning" by Trevor Hastie, Robert Tibshirani (2nd edition)

**B05:** Pattern Classification" by Duda and Hart (2nd edition)

### 4. Other readings and relevant websites:

S. No.	Link of Journals, Magazines, websites and Research Papers
1	<a href="https://www.analyticsvidhya.com/machine-learning/">https://www.analyticsvidhya.com/machine-learning/</a>
2	<a href="https://towardsdatascience.com/machine-learning/home">https://towardsdatascience.com/machine-learning/home</a>
3	<a href="https://www.geeksforgeeks.org/machine-learning/">https://www.geeksforgeeks.org/machine-learning/</a>
4	<a href="https://www.javatpoint.com/machine-learning">https://www.javatpoint.com/machine-learning</a>
5	<a href="https://medium.com/@randylaosat/a-beginners-guide-to-machine-learning-dfad19f6caf">https://medium.com/@randylaosat/a-beginners-guide-to-machine-learning-dfad19f6caf</a>

### 5. Recommended Tools and Platforms

Anaconda, Jupyter Notebook, Pycharm, VSCode, Google Colab

**6. Course Plan: Theory+Lab**
**a. Theory Plan**

Lect. No.	Topics
1-3	Introduction to Machine Learning: Basic Terminology, Types of Machine Learning, Supervised, Unsupervised, and Semi-Supervised Learning.
4-7	Revision - Python, Numpy, Pandas, Matplotlib (Prerequisite)
8-9	Linear Regression - Linear Regression Ideal, Best Line, Concept, Best Line Metric, Best Line Math Metric
10-12	Linear Regression - Loss functions, Loss function minimize, Square Function, MSE/RMSE, Assumptions of Linear Regression
13-14	Introduction to Gradient Descent, Stochastic Gradient Descent, Mini Batch Gradient Descent.
15-17	Multiple Linear Regression, Polynomial Regression using case studies.
18-20	Classification - Evaluation Metric (Confusion metric, Precision, Recall, F1-Score), Loss function vs Cost Function.
21-24	Classification - Logistic Regression, Step function, Sigmoid function, Loss Function, Optimization technique for loss function
<b>Sessional Test-1 (1-24 lectures)</b>	
25-26	Feature Selection, Bias-Variance Trade offs, Regularization techniques
27-30	Augmentations, K-Fold Cross Validation, Grid Search Cv/Random Search
31-32	Classification and Regression with KNN.
33-36	KNN Complexity and Overfitting vs Underfitting.
37-38	Sklearn Documentation and cross_val_score
39-41	Imbalanced Dataset - Oversampling, Downsampling, Weighting classes
42-45	How to Handle Categorical and Missing Values in a dataset, Feature Importance, Collinearity, Hyper-parameter Tuning
46-47	Dimensionality Reduction - PCA, TSNE
48-50	Dimensionality Reduction - Applications and use case studies
<b>Sessional Test-2 (25-50 lectures)</b>	
51-54	PCA and SVD it's working, Eigen Values, Eigen vectors, Covariance matrix.
55-56	Unsupervised Learning Algorithm - K-Means Clustering, Elbow Method
56-60	Classification and Regression with KNN, SVM, Decision Trees, Random Forest
<b>END-TERM EXAM (FULL SYLLABUS)</b>	

**b. Lab Plan:**

Lab No.	Experiment
1	Study of Python programming and scientific libraries: NumPy, Pandas, and Matplotlib (Prerequisite)
2	Exploratory Data Analysis (EDA): data loading, cleaning, handling missing values, and visualization
3	Introduction to Machine Learning: basic terminology, types of Machine Learning, and ML workflow
4	Implementation of Simple Linear Regression and visualization of the best-fit line
5	Linear Regression evaluation: loss functions, MSE, RMSE, and assumptions of Linear Regression
6	Implementation and comparison of Gradient Descent, Stochastic Gradient Descent, and Mini-batch Gradient Descent
7	Implementation of Multiple Linear Regression using a real-world case study
8	Implementation of Polynomial Regression and analysis of overfitting and underfitting
9	Study and implementation of classification evaluation metrics: Confusion Matrix, Precision, Recall, and F1-Score
10	Implementation of Logistic Regression: sigmoid function, loss function, and optimization
11	Feature Selection techniques, Bias–Variance trade-off, and Regularization methods
12	Model validation using K-Fold Cross Validation and Hyperparameter Tuning (Grid Search / Random Search)
13	Implementation of K-Nearest Neighbors (KNN) for classification and regression
14	Analysis of KNN complexity and study of Overfitting vs Underfitting
15	Handling imbalanced datasets using Oversampling, Under sampling, and Class Weighting
16	Data preprocessing and feature engineering: categorical encoding, missing values, feature importance, and collinearity
17	Dimensionality Reduction techniques: PCA, t-SNE, and study of PCA using Eigenvalues, Eigenvectors, and SVD
18	Implementation of Unsupervised Learning and ensemble models: K-Means Clustering (Elbow Method), SVM, Decision Tree, and Random Forest
19	Microsoft Power BI Data Analyst (PL300): Preparation of data for analysis, Model data, Design Reports, Manage and Secure Power BI.
<b>Lab Evaluation (1-18 Lab No.)</b>	

**7. Delivery/Instructional Resources****Plan (Theory +Lab):**



Lect. No.	Topics	CLO	Book & Chapter	TLM	ALM	PPT URL	Web Reference	Audio-Video Link
1-3	Introduction to Machine Learning: Basic Terminology, Types of Machine Learning, Supervise Learning, Unsupervised Learning, Semi-Supervised Learning.	CLO1	Book1 Ch1	Lecture	Discussion	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=introduction+to+machine+learning+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=introduction+to+machine+learning+ppt</a>	<a href="https://www.salesforce.com/blog/2020/06/real-world-examples-of-machine-learning.html">https://www.salesforce.com/blog/2020/06/real-world-examples-of-machine-learning.html</a>	<a href="https://www.youtube.com/watch?v=jGwO_UgTS7I">https://www.youtube.com/watch?v=jGwO_UgTS7I</a>
4-7	Revision - Python, Numpy, Pandas, Matplotlib (Pre-requisite)	CLO1	Book2 Ch2	Lecture /Discussion, Lab	Hands-on	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=numpy+pandas+matplotlib+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=numpy+pandas+matplotlib+ppt</a>	<a href="https://towardsdatascience.com/the-data-science-trilogy-numpy-pandas-and-matplotlib-basics-42192b89e26">https://towardsdatascience.com/the-data-science-trilogy-numpy-pandas-and-matplotlib-basics-42192b89e26</a>	<a href="https://www.youtube.com/watch?v=vmEHCJofslg">https://www.youtube.com/watch?v=vmEHCJofslg</a>
8-9	Linear Regression - Linear Regression Ideal, Best Line, Concept, Best Line Metric, Best Line Math Metric	CLO2	Book1 Ch3	Lecture /Discussion	Numeric-al	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=linear+regression+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=linear+regression+ppt</a>	<a href="https://www.analyticsvidhya.com/blog/2021/10/everything-you-need-to-know-about-linear-regression/">https://www.analyticsvidhya.com/blog/2021/10/everything-you-need-to-know-about-linear-regression/</a>	<a href="https://www.youtube.com/watch?v=ZkjP5RJLQF4">https://www.youtube.com/watch?v=ZkjP5RJLQF4</a>
10-12	Linear Regression - Loss functions, Loss function minimize, Square Function, MSE/RMSE, Assumptions of Linear Regression	CLO2	Book1 Ch3	Lecture /Discussion	Problems	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=loss+functions+machine+learning+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=loss+functions+machine+learning+ppt</a>	<a href="https://towardsdatascience.com/evaluation-metrics-model-selection-in-linear-regression-73c7573208be">https://towardsdatascience.com/evaluation-metrics-model-selection-in-linear-regression-73c7573208be</a>	<a href="https://www.youtube.com/watch?v=HBi-P5j0Kec">https://www.youtube.com/watch?v=HBi-P5j0Kec</a>
13-14	Introduction to Gradient Descent, Stochastic Gradient Descent, Mini Batch Gradient Descent.	CLO2	Book1 Ch4	Lecture /Discussion	Tracing	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=gradient+descent+">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=gradient+descent+</a>	<a href="https://www.javatpoint.com/gradient-descent-in-machine-learning">https://www.javatpoint.com/gradient-descent-in-machine-learning</a>	<a href="https://www.youtube.com/watch?v=IHZwWFHWa-w">https://www.youtube.com/watch?v=IHZwWFHWa-w</a>

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15-17	Classification - Logistic Regression, Step function, Sigmoid function, Loss Function, Optimization technique for loss function	CLO3	Book1 Ch5	Lecture /Discussion	Case Study	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=logistic+regression+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=logistic+regression+ppt</a>	<a href="https://www.javatpoint.com/logistic-regression-in-machine-learning">https://www.javatpoint.com/logistic-regression-in-machine-learning</a>	<a href="https://www.youtube.com/watch?v=yIYKR4sgzI8">https://www.youtube.com/watch?v=yIYKR4sgzI8</a>
18-20	Classification - Evaluation Metric (Confusion metric, Precision, Recall, F1-Score), Loss function vs Cost Function.	CLO3	Book1 Ch6	Lecture /Discussion	Dataset	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=confusion+matrix+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=confusion+matrix+ppt</a>	<a href="https://medium.com/@nandinisekar27/logistic-regression-overview-and-its-error-metrics-8b54512ca39f">https://medium.com/@nandinisekar27/logistic-regression-overview-and-its-error-metrics-8b54512ca39f</a>	<a href="https://www.youtube.com/watch?v=Kdsp6soqA7o">https://www.youtube.com/watch?v=Kdsp6soqA7o</a>
21-24	Multiple Linear Regression, Polynomial Regression using case studies.	CLO2	Book1 Ch7	Lecture /Discussion	Analysis	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=polynomial+regression+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=polynomial+regression+ppt</a>	<a href="https://towardsdatascience.com/polynomial-regression-bbe8b9d97491">https://towardsdatascience.com/polynomial-regression-bbe8b9d97491</a>	<a href="https://www.youtube.com/watch?v=QptIvDle8Y">https://www.youtube.com/watch?v=QptIvDle8Y</a>
25-26	Feature Selection, Bias-Variance Trade offs, Regularization techniques	CLO4	Book1 Ch8	Lecture /Discussion	Comparison	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=bias+variance+tradeoff+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=bias+variance+tradeoff+ppt</a>	<a href="https://towardsdatascience.com/regularization-on-the-path-to-bias-variance-trade-off-b7a7088b4577">https://towardsdatascience.com/regularization-on-the-path-to-bias-variance-trade-off-b7a7088b4577</a>	<a href="https://www.youtube.com/watch?v=EuBBz3bI-aA">https://www.youtube.com/watch?v=EuBBz3bI-aA</a>
27-30	Augmentations, K-Fold Cross Validation, Grid Search CV/Random Search	CLO4	Book2 Ch6	Lecture /Discussion	Demo	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=k+fold+cross+validation+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=k+fold+cross+validation+ppt</a>	<a href="https://scikit-learn.org/stable/modules/cross_validation.html">https://scikit-learn.org/stable/modules/cross_validation.html</a>	<a href="https://www.youtube.com/watch?v=fSyztGwwBVw">https://www.youtube.com/watch?v=fSyztGwwBVw</a>
31-32	Classification and Regression with KNN.	CLO3	Book1 Ch9	Lecture /Discussion	Visualization	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=knn+algorithm+p">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=knn+algorithm+p</a>	<a href="https://www.javatpoint.com/k-nearest-neighbor-algorithm-for-machine-">https://www.javatpoint.com/k-nearest-neighbor-algorithm-for-machine-</a>	<a href="https://www.youtube.com/watch?v=HVXi-me0nQeI">https://www.youtube.com/watch?v=HVXi-me0nQeI</a>

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33-36	KNN Complexity and Overfitting vs Underfitting.	CLO4	Book1 Ch9	Lecture /Discussion	Graphs	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=overfitting+underfitting+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=overfitting+underfitting+ppt</a>	<a href="https://www.geeksforgeeks.org/underfitting-and-overfitting-in-machine-learning/">https://www.geeksforgeeks.org/underfitting-and-overfitting-in-machine-learning/</a>	<a href="https://www.youtube.com/watch?v=Gx0dV2fCh6M">https://www.youtube.com/watch?v=Gx0dV2fCh6M</a>
37-38	Sklern Documentation and cross_val_score	CLO4	Book2 Ch7	Live Demo	Exploration	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=scikit+learn+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=scikit+learn+ppt</a>	<a href="https://scikit-learn.org/stable/">https://scikit-learn.org/stable/</a>	<a href="https://www.youtube.com/watch?v=0Lt9w-BxKFQ">https://www.youtube.com/watch?v=0Lt9w-BxKFQ</a>
39-41	Imbalanced Dataset - Oversampling, Down sampling, Weighting classes	CLO5	Book1 Ch10	Lecture /Discussion	Case	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=imbalanced+dataset+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=imbalanced+dataset+ppt</a>	<a href="https://machinelearningmastery.com/random-oversampling-and-undersampling-for-imbalanced-classification/">https://machinelearningmastery.com/random-oversampling-and-undersampling-for-imbalanced-classification/</a>	<a href="https://www.youtube.com/watch?v=1KJwOY7XvRk">https://www.youtube.com/watch?v=1KJwOY7XvRk</a>
42-45	How to Handle Categorical and Missing Values in a dataset, Feature Importance, Collinearity, Hyper-parameter Tuning	CLO4	Book2 Ch8	Discussion	Dataset	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=feature+engineering+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=feature+engineering+ppt</a>	<a href="https://towardsdatascience.com/supervised-machine-learning-feature-engineering-and-hyper-parameter-tuning-a3da583dd7b9">https://towardsdatascience.com/supervised-machine-learning-feature-engineering-and-hyper-parameter-tuning-a3da583dd7b9</a>	<a href="https://www.youtube.com/watch?v=Z_j1Xw2fCkQ">https://www.youtube.com/watch?v=Z_j1Xw2fCkQ</a>
46-47	Dimensionality Reduction - PCA, TSNE	CLO5	Book1 Ch11	Lecture	Visualization	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=pca+tsne+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=pca+tsne+ppt</a>	<a href="https://www.geeksforgeeks.org/difference-between-pca-vs-t-sne/">https://www.geeksforgeeks.org/difference-between-pca-vs-t-sne/</a>	<a href="https://www.youtube.com/watch?v=FgakZw6K1QQ">https://www.youtube.com/watch?v=FgakZw6K1QQ</a>

48-50	Dimensionality Reduction - Applications and use case studies	CLO5	Book1 Ch11	Lecture /Discussion	Case	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=applications+of+pc+a+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=applications+of+pc+a+ppt</a>	<a href="https://www.geeksforgeeks.org/dimensionality-reduction/">https://www.geeksforgeeks.org/dimensionality-reduction/</a>	<a href="https://www.youtube.com/watch?v=HMOI_lkzW08">https://www.youtube.com/watch?v=HMOI_lkzW08</a>
51-54	PCA and SVD it's working, Eigen Values, Eigen vectors, Covariance matrix.	CLO5	Book1 Ch12	Lecture	Derivation	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=pca+svd+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=pca+svd+ppt</a>	<a href="https://medium.com/@notsokarda/pca-vs-svd-simplified-32c5c753998">https://medium.com/@notsokarda/pca-vs-svd-simplified-32c5c753998</a>	<a href="https://www.youtube.com/watch?v=HfY8p-g1yqo">https://www.youtube.com/watch?v=HfY8p-g1yqo</a>
55-56	Unsupervised Learning Algorithm - K-Means Clustering, Elbow Method	CLO5	Book1 Ch13	Lecture /Discussion	Clusters	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=k+m+eans+clusterin+g+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=k+m+eans+clusterin+g+ppt</a>	<a href="https://www.analyticsvidhya.com/blog/2019/08/comprehensive-guide-k-means-clustering/">https://www.analyticsvidhya.com/blog/2019/08/comprehensive-guide-k-means-clustering/</a>	<a href="https://www.youtube.com/watch?v=ElIU-EPCIZM">https://www.youtube.com/watch?v=ElIU-EPCIZM</a>
56-60	Classification and Regression with KNN, SVM, Decision Trees, Random Forest	CLO6	Book1 Ch14	Lecture /Discussion	Comparison	<a href="https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=svm+random+forest+ppt">https://www.slideshare.net/search/slideshow?searchfrom=header&amp;q=svm+random+forest+ppt</a>	<a href="https://www.analyticsvidhya.com/blog/2021/06/understanding-random-forest/">https://www.analyticsvidhya.com/blog/2021/06/understanding-random-forest/</a>	<a href="https://www.youtube.com/watch?v=yN7ypxC7838">https://www.youtube.com/watch?v=yN7ypxC7838</a>

## 8. Remedial Classes

After every Sessional Test, different types of learners will be identified, and special discussions will be planned and scheduled accordingly for the slow learners.

## 9. Self-Learning

Assignments to promote self-learning, survey of contents from multiple sources.

S. No.	Topics	CLO	ALM	References/MOOCs
1	Machine Learning Fundamentals: Types of Learning, Linear & Logistic Regression, Evaluation Metrics	CLO01, CLO02, CLO03	Think-Pair-Share	<a href="https://www.coursera.org/learn/machine-learning">https://www.coursera.org/learn/machine-learning</a> <a href="https://developers.google.com/machine-learning/crash-course">https://developers.google.com/machine-learning/crash-course</a>
2	Model Evaluation, Feature Selection, Cross Validation, and Hyper-parameter Tuning using Scikit-learn	CLO03, CLO04, CLO05	Problem-based Learning	<a href="https://scikit-learn.org/stable/tutorial/index.html">https://scikit-learn.org/stable/tutorial/index.html</a> <a href="https://www.kaggle.com/learn/intro-to-machine-learning">https://www.kaggle.com/learn/intro-to-machine-learning</a>

## 10. Delivery Details of Content Beyond Syllabus



Any content delivered beyond the syllabus will be planned for all students, and the schedule will be notified accordingly.

S. No.	Advanced Topics, Additional Reading, Research papers and any	CLO	POs	ALM	References/MOOCs
1	Advanced Regression Techniques: Ridge, Lasso, Elastic Net and Model Interpretability	CLO01, CLO02, CLO05	PO1, PO2, PO3, PO4, PO7, PO11	Think–Pair–Share	<a href="https://scikit-learn.org/stable/modules/linear_model.html">https://scikit-learn.org/stable/modules/linear_model.html</a> <a href="https://machinelearningmastery.com/elastic-net-regression-in-python/">https://machinelearningmastery.com/elastic-net-regression-in-python/</a>
2	Advanced Classification & Ensemble Learning: SVM, Decision Trees, Random Forest, Boosting	CLO01, CLO03, CLO05	PO1, PO2, PO3, PO5, PO7, PO11	Think–Pair–Share	<a href="https://scikit-learn.org/stable/supervised_learning.html">https://scikit-learn.org/stable/supervised_learning.html</a> <a href="https://towardsdatascience.com/ensemble-learning-2c8a1f9e9c3e">https://towardsdatascience.com/ensemble-learning-2c8a1f9e9c3e</a>
3	Dimensionality Reduction for Large-Scale Data: Advanced PCA, Kernel PCA, Autoencoders (Intro)	CLO04, CLO05	PO1, PO2, PO3, PO4, PO7, PO11	Case-based Learning	<a href="https://scikit-learn.org/stable/modules/decomposition.html">https://scikit-learn.org/stable/modules/decomposition.html</a> <a href="https://www.coursera.org/learn/deep-neural-networks">https://www.coursera.org/learn/deep-neural-networks</a>

#### 11. Evaluation Scheme & Components:

Assessment Type	Evaluation Component	Type of Component	No. of Assessments	% Weightage of Component	Max. Marks	Mode of Assessment	CLO
Certification Exam	Component 1	Certification	01	20%	20	Computer Based Test	CLO01, CLO02, CLO03, CLO04, CLO05
Summative	Component2	Sessional Tests (STs)	02*	30%	20	Computer Based Test	CLO01, CLO02, CLO03, CLO04, CLO05
Summative	Component 3	End Term Examination	01**	50%	50	Computer Based Test	CLO01, CLO02, CLO03, CLO04, CLO05
<b>Total</b>			<b>100%</b>				

\*Average of the 02 STs will be considered for the evaluation of the STs as final marks.

\*\*To be eligible to appear for the End Term Exam, attendance must be at least 75%

#### 12. Syllabus of the Course:

Subject: Supervised and Unsupervised Learning			Subject Code:	
S. No.	Topic (s)	No. of	Weightage	
1-3	Introduction to Machine Learning: Basic Terminology, Types of Machine	3	10%	
4-10	Revision - Python, Numpy, Pandas, Matplotlib (Pre-requisite)	7	5%	
11-20	Linear Regression - Loss functions, Loss function minimize, Square Function, MSE/RMSE, Assumptions of Linear Regression,	10	20%	
21-30	Multiple Linear Regression, Polynomial Regression using case studies. Feature	10	20%	

31-43	Classification and Regression with KNN. KNN Complexity and Over fitting vs Under fitting.	13	20%
44-54	How to Handle Categorical and missing values in a dataset, Feature Importance, Collinearity, Hyper-parameter Tuning,	11	20%
55-60	Unsupervised Learning Algorithm - K-Means Clustering, Elbow Method, Classification and Regression with KNN, SVM, Decision Trees, Random Forest	6	5%

### 13. Academic Integrity Policy:

Education at Chitkara University builds on the principle that excellence requires freedom where Honesty and integrity are its prerequisites. Academic honesty in the advancement of knowledge requires that all students and Faculty respect the integrity of one another's work and recognize the importance of acknowledging and safeguarding intellectual property. Any breach of the same will be tantamount to severe academic penalties.

### This Document is approved by:

Designation	Name	Signature
Course Coordinator	Dr. Harjeet Singh	
Asso. Dean (CSE-AI)	Dr. Vikas Solanki	
Pro-VC (CSE)	Dr. Meenu Khurana	
Date (DD/MM/YYYY)	14/01/2026	