S. No.	Lesson	Topic. no.	Topic	Sub-topic	Sub-topic	Sub-sub-topic
1	**Course Introduction**	**1.1**	Learning Path			
		1.2	Program Components			
2	**Introduction to Machine Learning**	**2.1**	What Is Machine Learning?			
		2.2	Types of Machine Learning			
		2.3	Introduction to Python Packages for Machine Learning			
3	**Supervised Learning: Regression and Its Application**	**3.1**	Supervised Learning	**3.1.1**	Introduction to Supervised Learning	
				3.1.2	Supervised Learning techniques	
				3.1.3	Classification	
				3.1.4	Regression	
				3.1.5	Applications of Supervised Learning:	
				3.1.6	Supervised Learning algorithm: Linear Regression Logistic Regression Naive Bayes K-Nearest Neighbors (KNN) Decision Trees Random Forests Support Vector Machines (SVM)	
		3.2	What Is Regression?			
		3.3	Types of Regression	**3.3.1**	Linear Regression	Simple Linear Regression Multiple Linear Regression
				3.3.2	Non-Linear Regression	Polynomial Regression
		3.4	Model Evaluation and Validation	**3.4.1**	Cross-Validation Techniques	
				3.4.2	Performance Metrics for Regression	Mean Squared Error (MSE) Root Mean Squared Error (RMSE)
		3.5	Regularization Techniques	**3.5.1**	Introduction to Regularization	
				3.5.2	Lasso Regression (L1 Regularization)	
				3.5.3	Ridge Regression (L2 Regularization)	
				3.5.4	Elastic Net Regression	
		3.6	Hyperparameter Tuning	**3.6.1**	Grid Search	
				3.6.2	Random Search	
4	**Supervised Learning: Classification and Its Applications**	**4.1**	Classification			
		4.2	Applications of Classification			
		4.3	Types of Classification	**4.3.1**	Binary Classification, Multiclass Classification, Multi-label Classification, Imbalanced Classification	
		4.4	Binary Classification	**4.4.1**	Logistic Regression	Mathematical Concept of Logistic Regression Example with Breast Cancer Dataset
				4.4.2	Performance Metrics Used in Classification	Significance of the Confusion Matrix
				4.4.3	Naive Bayes Classifier	Mathematical Concept of Naive Bayes Applying Naive Bayes Algorithm on Breast Cancer Dataset
				4.4.4	K-Nearest Neighbors (KNN)	Applying K-Nearest Neighbors on Breast Cancer Dataset Hyperparameter Tuning in KNN
				4.4.5	Decision Tree	How Decision Trees Work Metrics for Splitting Pruning Applying Decision Tree on Breast Cancer Dataset Hyperparameter Tuning in Decision Tree
				4.4.6	Support Vector Machine (SVM)	Applying SVM on Breast Cancer Dataset
		4.5	Multiclass Classification	**4.5.1**	Example with Online Gaming Behavior Dataset Naive Bayes Algorithm	Hyperparameter Tuning
				4.5.2	K-Nearest Neighbors	
				4.5.3	Decision Tree	
				4.5.4	Random Forest	
				4.6.1	Examples of Multi-label classification	

		4.6	Multi-Label Classification	**4.6.2**	Algorithms for Multi-Label Classification	
				4.6.3	Challenges in Multi-Label Classification	
		4.7	Handling Imbalanced Data in Classification	**4.7.1**	Introduction to Imbalanced Data	
				4.7.2	Oversampling Techniques (e.g., SMOTE)	
				4.7.3	Undersampling Techniques	
				4.7.4	Ensemble Methods for Imbalanced Data	
5	**Ensemble Learning**	**5.1**	Introduction to Ensemble Learning	**5.1.1**	Goals of ensemble learning	
				5.1.2	Importance of ensemble learning	
				5.1.3	Weak and Strong learners in Ensemble learning	
		5.2	Categories in ensemble learning	**5.2.1**	Sequential ensemble technique	
				5.2.2	Parallel ensemble technique	
		5.3	Simple techniques used in ensemble learning	**5.3.1**	Voting	Hard Voting
				5.3.2	Averaging	
				5.3.3	Weighted Averaging	
		5.4	Advanced techniques used in ensemble learning	**5.4.1**	Bagging (bootstrap aggregating)	Bagging Techniques
				5.4.2	Boosting	Boosting Techniques
				5.4.3	Stacking	Advantages of stacking
6	**Unsupervised Algorithms**	**6.1**	Introduction to Unsupervised Learning	**6.1.1**	What Is Unsupervised Learning?	
				6.1.2	Approaches to Unsupervised algorithm (Clustering, Dimensionality Reduction, Association rule)	
		6.2	Clustering Techniques	**6.2.1**	Overview of Clustering	
				6.2.2	K-Means Clustering:	Algorithm and Implementation
						Choosing the Number of Clusters (Elbow Method, Silhouette Score)
				6.2.3	Hierarchical Clustering:	Agglomerative vs. Divisive Methods
						Dendrograms and Linkage Criteria
				6.2.4	DBSCAN (Density-Based Spatial Clustering of Applications with Noise)	
		6.3	Dimensionality Reduction Techniques:	**6.3.1**	Importance of Dimensionality Reduction	
				6.3.2	Principal Component Analysis (PCA)	
				6.3.3	Linear Discriminant Analysis (LDA)	
				6.3.4	t-Distributed Stochastic Neighbor Embedding (t-SNE)	
		6.4	Association Rule Learning	**6.4.1**	Introduction to Association Rule Learning	
				6.4.2	Apriori Algorithm	
				6.4.3	Eclat Algorithm	
		6.5	Anomaly Detection Techniques	**6.5.1**	Isolation forest	
		6.6	Model Evaluation in Unsupervised Learning:	**6.6.1**	Silhouette Score for Clustering	
7	**Introduction to recommendation system**	**7.1**	Overview of Recommendation Systems	**7.1.1**	What are Recommendation Systems?	
				7.1.2	Importance and Applications	
		7.2	Examples of Recommendation Systems	**7.2.1**	Enhanced Book Discovery Recommendations	
				7.2.2	Hyper-Personalized Media Recommendations	
				7.2.3	Viewed Items Recommendations	
				7.2.4	Enhanced Product Discovery Recommendations	
		7.3	Types of Recommendation Systems	**7.3.1**	Collaborative Filtering	Memory-Based Collaborative Filtering
				7.3.2	Content-Based Filtering	
				7.3.3	Hybrid Filtering	
		7.4	Advanced Techniques in Recommendation Syste	**7.4.1**	The GetTopN Function	
				7.4.2	Hit Rate	
		7.5	Addressing Challenges in Recommendation Syste	**7.5.1**	Cold Start Problem	
				7.5.2	Implicit and Explicit Feedback	
	CEPs	**Creating Cohorts of Songs**				
		Employee Turnover Analytics				