# Department of Computer Applications

## Details of Lesson Plan

| S.No. | Particulars | Details |
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| 1. | Course Name | Machine learning using Python |
| 2. | Course Code | MCA 303 |
| 3. | Academic Year | 2024-25 |
| 4. | Semester | 3rd |
| 5. | Number of Lesson plans | 32 |
| 6. | Faculty Assigned | Ms. Arti Kotru |

Ms. Arti Kotru
Faculty Signature

| Lesson Plan No. 1 | Course Name: Machine Learning using Python<br>Topic: Introduction to Machine Learning | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the basic concept of Machine Learning<br>b. Explore various types of Machine Learning<br>c. Analyze the advantages and disadvantages of ML |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Discuss examples of machine learning applications<br>- Discuss self-driving cars, recommendation systems<br><br>- **Development** (30 minutes)<br>- Definition of Machine Learning<br>- Types of Machine Learning<br>- Supervised Machine learning<br>- Unsupervised Machine Learning<br>- Semi-supervised<br>- Reinforcement learning<br>- Advantages and Disadvantages<br>- Example of each<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested NPTEL video lecture<br>https://nptel.ac.in/courses/106106139<br><br>Reference website:<br>https://www.javatpoint.com/machine-learning<br><br>Suggested Reading books:<br>- Machine Learning, A Probabilistic Perspective by Kevin Murphy.<br><br>3. Homework<br>• Define Machine Learning. Discuss with examples why machine learning is important.<br>• Discuss with examples some useful applications of machine learning. |

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| | • Explain how some areas/disciplines influenced machine learning.<br>• How does supervised learning differ from unsupervised learning in terms of data labeling?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.<br>2. Quiz on Machine Learning<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 2 | Course Name: Machine Learning using Python<br>Topic: Design of learning system | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the concept of Learning system.<br>b. Articulate the steps in the design of learning system.<br>c. Demonstrate the steps with help of examples and flowcharts. |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Begin by discussing the role of machine learning in modern society.<br>- Highlight the importance of designing effective learning systems for machine learning applications.<br>- Introduce the unique challenges and considerations involved in designing such systems<br><br>- **Development** (30 minutes)<br>- Overview of learning system.<br>- Overview of how a system can learn and give desired output.<br>- About steps and design of learning system.<br>- Example<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested NPTEL video lecture<br>https://nptel.ac.in/courses/106106139<br><br>Reference website:<br>https://www.javatpoint.com/machine-learning<br><br>Suggested Reading books:<br>Machine Learning, A Probabilistic Perspective by Kevin Murphy.<br><br>3. Homework<br>• How do you develop assessments that accurately measure the achievement of learning objectives?<br>• How do you define clear and measurable learning objectives for a learning system? |

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| | • What are the key factors to consider when conducting a learner analysis for a learning system?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.<br>2. Quiz on Learning system<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 3 | Course Name: Machine Learning using Python<br>Topic: Training and testing sets | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Understand the importance of dividing a dataset into training and testing sets.<br>b. Explain the concept of overfitting and underfitting.<br>c. Understand labeled and unlabeled data. |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Begin by discussing the importance of evaluating the performance of a machine learning model.<br>- Explain that dividing a dataset into training and testing sets is a crucial step in this process.<br>- Introduce the concepts of overfitting and underfitting.<br><br>- **Development** (30 minutes)<br>- Overview of reinforcement Machine learning<br>- Overview of semi supervised Machine Learning<br>- About Labelled data<br>- Overview of Clustering<br>- Example<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=CwjLMV52tzI<br><br>Reference website:<br>https://www.javatpoint.com/machine-learning<br><br>Suggested Reading books:<br>Machine Learning, A Probabilistic Perspective by Kevin Murphy.<br><br>3. Homework<br>• Why is it important to divide a dataset into training and testing sets?<br>• What is the difference between a training set and a testing |

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| | set?<br>• What is cross-validation and why is it useful?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.<br>2. Quiz on training & testing set<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 4 | Course Name: Machine Learning using Python<br>Topic: cross-validation | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Understand the concept of cross-validation.<br>b. Differentiate between different types of cross-validation.<br>c. Apply cross-validation to evaluate machine learning models |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Begin by discussing the importance of evaluating the performance of a machine learning model.<br>- Explain the limitations of using a single train-test split.<br>- Introduce the concept of cross-validation as a technique to improve model evaluation.<br><br>- **Development** (30 minutes)<br>- Overview of Training Set<br>- Overview of Testing Set<br>- Introduction to Cross Validation<br>- Types of Cross Validation<br>- Holdout validation<br>- leave-one-out cross validation<br>- k-fold cross validation<br>- Stratified Cross-Validation<br>- Advantages and Disadvantages of each of them<br>- Examples<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested NPTEL video lecture<br>https://www.youtube.com/watch?v=jtZfCpo0858<br><br>3. Reference website:<br>https://www.geeksforgeeks.org/machine-learning/<br><br>Suggested Reading books: |

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| | Machine Learning, A Probabilistic Perspective by Kevin Murphy.<br><br>4. Homework<br>• What is the primary purpose of cross-validation in machine learning?<br>• What is 'training Set' and 'test Set' in a Machine Learning Model?<br>• Can cross-validation be used to compare the performance of different machine learning algorithms?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.<br>2. Quiz on cross-validation in machine learning<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 5 | Course Name: Machine Learning using Python<br>Topic: Dimensionality Reduction/ Feature Reduction | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Understand the concept of dimensionality reduction.<br>b. Explore common dimensionality reduction techniques.<br>c. Apply dimensionality reduction to real-world datasets |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Begin by discussing the challenges of working with high-dimensional data.<br>- Explain the concept of dimensionality reduction as a technique to reduce the number of features while preserving important information.<br>- Highlight the benefits of dimensionality reduction, such as improved computational efficiency and enhanced visualization.<br><br>- **Development** (30 minutes)<br>- Overview of Dimensionality Reduction/ Feature Reduction<br>- Two Approaches to Dimensionality Reduction<br>- Feature selection<br>- Wrapping<br>- Filtering<br>- Embedding<br>- Feature extraction<br>- Principal Component Analysis<br>- Linear Discriminant Analysis<br>- Advantages and Disadvantages of Dimensionality Reduction<br>- Few Example<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=AU_hBML2H1c<br>3. Reference website:<br>https://www.geeksforgeeks.org/machine-learning/ |

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| | Suggested Reading books:<br>Machine Learning, A Probabilistic Perspective by Kevin Murphy.<br><br>4. Homework<br>• What are some real-world applications of dimensionality reduction<br>• What is the primary goal of dimensionality reduction?<br>• How can dimensionality reduction be used to improve the performance of machine learning models?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.<br>2. Quiz on Dimensionality Reduction/ Feature Reduction<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 6 | Course Name: Machine Learning using Python<br>Topic: Applications of Machine Learning | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. To understand the basic concepts of Machine Learning.<br>b. To explore various real-world applications of Machine Learning.<br>c. To analyze the impact of Machine Learning on society |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Begin by asking students if they have heard about Machine Learning.<br>- Define Machine Learning as a subset of artificial intelligence that allows computers to learn from data and improve their performance over time without being explicitly programmed.<br>- Provide examples of everyday tasks that involve Machine Learning, such as:<br>- Recommendation systems on platforms like Netflix and Spotify<br>- Facial recognition in smartphones<br>- Self-driving cars<br>- Spam filters in email.<br><br>- **Development** (30 minutes)<br>- Facilitate a class discussion on the impact of Machine Learning on society.<br>- Emphasize the importance of understanding Machine Learning and its applications in today's world:<br>- Self-driving cars<br>- Entertainment<br>- Visual recognition<br>- Virtual assistant<br>- Fraud detection<br>- NLP<br>- News aggregation and fraud news detection<br>- Detecting developmental delay in children<br>- Colorization of black & white images<br>- Adding sounds to silent movies<br>- Healthcare<br>- Automatic machine translation<br>- Automatic handwriting generation<br>- Demographic & election predictions<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session. |

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| | Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://nptel.ac.in/courses/106106139<br><br>3. Reference website:<br>https://www.javatpoint.com/machine-learning<br><br>Suggested Reading books:<br>Machine Learning, A Probabilistic Perspective by Kevin Murphy.<br><br>4. Homework<br>• What are the potential benefits of Machine Learning?<br>• What are the potential risks or challenges?<br>• How can we ensure that Machine Learning is used ethically and responsibly?<br>• What are the future implications of Machine Learning?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.<br>2. Quiz on applications of Machine Learning<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 7 | Course Name: Machine Learning using Python<br>Topic: Performance prediction parameters | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Understand the concept of performance prediction in machine learning.<br>b. Identify key performance prediction parameters.<br>c. Learn how to evaluate the effectiveness of a machine learning model using these parameters. |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Define performance prediction in the context of machine learning.<br>- Explain the importance of evaluating model performance.<br><br>- **Development** (30 minutes)<br>- Performance Metrics for Classification<br>- Accuracy<br>- Precision<br>- Recall<br>- F1-score<br>- Confusion Matrix<br>- ROC Curve<br>- Performance Metrics for Regression<br>- Mean Absolute Error<br>- Mean Squared Error<br>- $R^2$ Score<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=Sowy3iZyRVk<br><br>3. Reference website:<br>https://www.javatpoint.com/performance-metrics-in-machine-learning<br><br>Suggested Reading books: |

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| | Machine Learning, A Probabilistic Perspective by Kevin Murphy.<br><br>4. Homework<br>• What is a performance metric in machine learning?<br>• Why are performance metrics important in machine learning?<br>• What are precision and recall?<br>• When is F1-score a good choice?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.<br>2. Quiz on Performance prediction parameters<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 8 | Course Name: Machine Learning using Python<br>Topic: Classification Algorithms | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Understand the concept of classification in machine learning.<br>b. Explore different classification algorithms (e.g., logistic regression, decision trees, random forests, support vector machines, naive Bayes).<br>c. Apply classification algorithms to real-world datasets |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Define classification as a task of predicting categorical labels.<br>- Explain the difference between classification and regression.<br>- Discuss the goal of classification: to assign data points to predefined classes.<br>- **Development** (30 minutes)<br>- Classification algorithm:<br>- Definition<br>- Two types of Classifications:<br>- Binary Classifier<br>- Multi-class Classifier<br>- Learners in Classification Problems:<br>- Lazy Learners<br>- Eager Learners<br>- Evaluating a Classification model:<br>- Confusion Matrix<br>- AUC-ROC Curve<br>- **Exercise** (10 minutes) –<br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br>2. Suggested video lecture<br>https://nptel.ac.in/courses/106106139<br>https://www.coursera.org/lecture/machine-learning-with-python/introduction-to-classification-95g22<br>3. Reference website:<br>https://www.javatpoint.com/classification-algorithm-in-machine- |

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| | learning<br><br>Suggested Reading books:<br>Machine Learning "A probabilistic Perspective" by Kevin Murphy<br><br>4. Homework<br>• What is classification in machine learning?<br>• What are the key steps involved in a classification task?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.<br>2. Quiz on classification in machine learning<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 9 | Course Name: Machine Learning using Python<br>Topic: Support Vector Machines. | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the basic concept of Classification and its algorithm- Support Vector Machines.<br>b. Analyse advantages and disadvantages of Support Vector Machines. |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- What is Supervised Machine Learning?<br>- What are different algorithms?<br>- **Development** (30 minutes)<br>- Overview of Machine learning<br>- Overview of Supervised Machine Learning<br>- Introduction to Support vector machines<br>- Example<br>- Advantages and Disadvantages<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://nptel.ac.in/courses/106106139<br><br>https://www.youtube.com/watch?v=SRVswRH5Q7E<br><br>Reference website:<br>https://www.javatpoint.com/machine-learning-support-vector-machine-algorithm<br><br>Suggested Reading books:<br>Machine Learning "A probabilistic Perspective" by Kevin Murphy<br><br>3. Homework<br>a) Define the SVM? What are the relevance and features of the Support Vector Machine? Explain the practical difficulties of the SVMs. |

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| | b) What are common kernel functions used in SVMs?<br>c) How are SVMs trained?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.<br>2. Quiz on Support Vector Machines<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 10 | Course Name: Machine Learning using Python<br>Topic: Decision Tree algorithm | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the basic concept of Classification and its algorithm- Decision Trees<br>b. Analyse advantages and disadvantages of Decision Tree algorithm. |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- What is Supervised Machine Learning?<br>- What are different algorithms?<br>- **Development** (30 minutes)<br>- Overview of Machine learning<br>- Overview of Supervised Machine Learning<br>- Introduction to Decision trees<br>- Discussion on the Decision Tree algorithm<br>- Example<br>- Advantages and Disadvantages<br>- **Exercise** (10 minutes) –<br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br>2. Suggested video lecture<br>https://www.coursera.org/lecture/python-machine-learning/decision-trees-Zj96A<br>https://nptel.ac.in/courses/106106139<br>3. Reference website:<br>https://www.javatpoint.com/machine-learning-decision-tree-classification-algorithm<br>Suggested Reading books:<br>Machine Learning "A probabilistic Perspective" by Kevin Murphy<br>4. Homework<br>• In what real-world applications are decision trees commonly used?.<br>• What is overfitting in the context of decision trees? How can it be |

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| | prevented?<br>• Explain Decision Tree classification algorithm with an Example.<br>• What are the different types of decision trees?<br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.<br>2. Quiz on Decision Tree algorithm<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 11 | Course Name: Machine Learning using Python<br>Topic: Principal Component Analysis | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the basic concept of Principal Component Analysis<br>b. Analyse advantages and disadvantages of Principal Component<br>c. Understand the working of Principal Component Analysis |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- What is Supervised Machine Learning?<br>- What are different algorithms?<br>- **Development** (30 minutes)<br>- Overview of Machine learning<br>- Overview of Supervised Machine Learning<br>- Introduction to Principal Component Analysis<br>- Step-By-Step Explanation of PCA<br>- How Principal Component Analysis (PCA) works?<br>- Advantages and Disadvantages<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=hkCT-6KJAK0<br><br>3. Reference website:<br>https://www.geeksforgeeks.org/principal-component-analysis-pca/<br><br>Suggested Reading books:<br>Machine Learning "A probabilistic Perspective" by Kevin Murphy<br><br>4. Homework<br>• What is Principal Component Analysis (PCA)?<br>• How does a PCA work?<br>• When should PCA be applied?<br>• How are principal components interpreted?<br>• What is the significance of principal components? |

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| | Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Principal Component Analysis<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 12 | Course Name: Machine Learning using Python<br>Topic: Artificial Neural Networks | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the basic concept of Artificial Neural Networks<br>b. Understand the various types of ANN<br>c. Analyse the different real-world applications of ANN |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- What are Neurons in Human Brain?<br>- What do you understand by term Neural Networks?<br>- How can you relate the Neural networks of Human Brain with Artificial Neural Network<br><br>- **Development** (30 minutes)<br>- Overview of Artificial Neural Networks<br>- Types of ANN.<br>- Hidden layers and patterns.<br>- Advantages and Disadvantages<br>- Applications of ANN<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=xbYgKoG4x2g<br><br>3. Reference website:<br>https://www.geeksforgeeks.org/artificial-neural-networks-and-its-applications/<br><br>https://www.javatpoint.com/artificial-neural-network<br><br>Suggested Reading books:<br>Machine Learning "A probabilistic Perspective" by Kevin Murphy<br><br>4. Homework<br>• What are Neural Networks with Example. |

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| | • Explain Artificial Neural Networks using diagrams.<br>• Explain the types of ANN.<br>• Explore some real-world applications of ANN.<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Artificial Neural Networks<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 13 | Course Name: Machine Learning using Python<br>Topic: Unsupervised Learning, Unlabelled data | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Grasp the basic concept of Unsupervised Learning<br>b. Understand the basic concept of unlabeled data.<br>c. Analyze advantages and disadvantages of unsupervised learning |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- What is Unsupervised Machine Learning?<br>- What are different algorithms?<br>- **Development** (30 minutes)<br>- Overview of Machine learning<br>- Overview of Unsupervised Machine Learning<br>- About Labelled data<br>- Overview of Clustering<br>- Types of Clustering<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=CwjLMV52tzI<br><br>3. Reference website:<br>https://www.javatpoint.com/unsupervised-machine-learning<br><br>Suggested Reading books:<br>Machine Learning "A probabilistic Perspective" by Kevin Murphy<br><br>4. Homework<br>• Explain the following with examples:<br>◦ Unsupervised learning.<br>◦ Unlabeled Data.<br>• What is clustering? Explain in detail.<br><br>Spend 5 minutes to wrap up and consolidate the learnings |

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| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Unsupervised Learning and clustering<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 14 | Course Name: Machine Learning using Python<br>Topic: Clustering | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Grasp the basic concept of clustering its algorithm<br>b. Understand advantages and disadvantages of clustering |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- What is Unsupervised Machine Learning?<br>- What are different algorithms?<br>- **Development** (30 minutes)<br>- Overview of Clustering<br>- Introduction to Hierarchical<br>- Example<br>- Introduction to Fuzzy<br>- Introduction to Distance, Density-based and Model-based<br>- Example<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=CwjLMV52tzI<br><br>3. Reference website:<br>https://www.upgrad.com/blog/clustering-and-types-of-clustering-methods/<br><br>Suggested Reading books:<br>Machine Learning "A probabilistic Perspective" by Kevin Murphy<br><br>4. Homework<br>• What is the fundamental idea behind hierarchical machine learning<br>• Can you describe the common types of hierarchical structures used in machine learning?<br>• What are some real-world applications of hierarchical machine learning? |

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| | Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Unsupervised Learning and clustering<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 15 | Course Name: Machine Learning using Python<br>Topic: K-means algorithm | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Grasp the basic concept of clustering and its K-means algorithm<br>b. Understand its advantages and disadvantages. |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- What is clustering and its types?<br>- What are different algorithms?<br><br>- **Development** (30 minutes)<br>- Overview of Clustering<br>• What is K-means Clustering?<br>• What is the objective of k-means clustering?<br>• How k-means clustering works?<br>• Example<br>• Advantages and Disadvantages<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=qg_M37WGKG8<br><br>3. Reference website:<br>https://www.javatpoint.com/k-nearest-neighbor-algorithm-for-machine-learning<br><br>Suggested Reading books:<br>Machine Learning "A probabilistic Perspective" by Kevin Murphy<br><br>4. Homework<br>• Explain K-mean clustering with the help of an example.<br>• When should you use classification over regression?<br>• What are the limitations of K-Means clustering?<br>• How do you measure the quality of a K-Means clustering result? |

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| | Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on K-mean clustering<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 16 | Course Name: Machine Learning using Python<br>Topic: Nearest Neighbour | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Grasp the basic concept of clustering and its Nearest Neighbour algorithm<br>b. Understand its advantages and disadvantages. |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- What is clustering and its types?<br>- What are different algorithms?<br><br>- **Development** (30 minutes)<br>- Overview of Clustering<br>• K-Nearest Neighbor(KNN) Algorithm<br>• What is the K-Nearest Neighbors Algorithm?<br>• Why do we need a KNN algorithm?<br>• Advantages and Disadvantages<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=2ATqoglcHus<br><br>3. Reference website:<br>https://www.javatpoint.com/k-nearest-neighbor-algorithm-for-machine-learning<br><br>Suggested Reading books:<br>Machine Learning "A probabilistic Perspective" by Kevin Murphy<br><br>4. Homework<br>• When should you use classification over regression?<br>• Discuss K-nearest Neighbour's (KNN) classification machine learning technique.<br>• What is the basic principle behind nearest neighbor algorithms?<br>Spend 5 minutes to wrap up and consolidate the learnings |

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| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on K-nearest Neighbour<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 17 | Course Name: Machine Learning using Python<br>Topic: Q learning | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the basic concept of Q- Learning<br>b. Grasp the basic concept of Difference Learning<br>c. Understand the concept of OFF policy and ON policy. |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>• Begin by asking students if they have encountered any reinforcement learning concepts before.<br>• Briefly explain the concept of reinforcement learning, emphasizing the idea of an agent interacting with an environment to maximize rewards.<br><br>- **Development** (30 minutes)<br>- Introduction of Q-learning in Reinforcement Learning<br>- Key Components of Q-learning<br>- How does Q-Learning Works?<br>- What is Q-table?<br>- Implementation of Q-Learning<br>- Step 1: Define the Environment<br>- Step 2: Set Hyperparameters<br>- Step 3: Implement the Q-Learning Algorithm<br>- Step 4: Output the Learned Q-Table<br>- Implement Q-Algorithm<br>- Advantages of Q-learning<br>- Disadvantages of Q-Learning<br>- Applications of Q-learning<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=l06oSHOR0x4<br>https://www.youtube.com/watch?v=aCEvtRtNO-M<br><br>3. Reference website: |

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| | https://www.geeksforgeeks.org/q-learning-in-python/<br><br>Suggested Reading books:<br>Machine Learning "A probabilistic Perspective" by Kevin Murphy<br><br>4. Homework<br>• How does the Q-learning update rule work?<br>• What is the difference between on-policy and off-policy learning?<br>• What are some real-world applications of Q-learning?<br>• What are some limitations of Q-learning?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Q-learning<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 18 | Course Name: Machine Learning using Python<br>Topic: Temporal difference learning | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Grasp the basic concept of Difference Learning<br>b. Understand the background and evolution of temporal difference learning<br>c. Analyze the significance of temporal difference learning |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Begin by reviewing the basic concepts of reinforcement learning, including agents, environments, states, actions, rewards, and policies.<br>- What is Q-learning?<br><br>- **Development** (30 minutes)<br>- Background and evolution of temporal difference learning<br>- Significance of temporal difference learning<br>- Mechanism of temporal difference learning<br>- Working Principles and Components<br>- Prediction Errors<br>- Temporal Dynamics:<br>- Value Function Update:<br>- Explaining How Temporal Difference Learning Operates<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=Udzp_KDLYUo<br><br>3. Reference website:<br>https://techtarget.com/searchenterpriseai/definition/Q-learning<br><br>https://www.larksuite.com/en_us/topics/ai-glossary/temporal-difference-learning<br><br>Suggested Reading books:<br>Machine Learning "A probabilistic Perspective" by Kevin Murphy |

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| | Homework<br>• What is the temporal difference error (TD error)?<br>• What are some common applications of TD learning?<br>• What are the challenges of using TD learning?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on temporal difference learning<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 19 | Course Name: Machine Learning using Python<br>Topic: Genetic Algorithm | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the basic concept of Genetic Algorithm<br>b. Explain the steps of Genetic Programming<br>c. Able to Explore the Examples and applied part of Genetic Programming<br>d. Grasp the advantages and disadvantages |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Begin by Basic understanding of biology and genetics<br><br>- **Development** (30 minutes)<br>- Overview of Genetic Algorithm<br>- Types of Genetic Algorithm<br>- Steps involved in genetic algorithm.<br>- Applications of genetic algorithm.<br>- Example<br>- Advantages and Disadvantages<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=Z_8MpZeMdD4<br><br>3. Reference website:<br>https://deepai.org/machine-learning-glossary-and-terms/genetic-programming<br><br>Suggested Reading books:<br>Machine Learning "A probabilistic Perspective" by Kevin Murphy<br><br>Homework<br>• How do you represent individuals in a GA?<br>• What is a fitness function, and how is it used in a GA?<br>• Explain the difference between crossover and mutation in GAs. |

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| | • What are some common selection methods used in GAs?<br>• In what types of problems are GAs typically applied?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Genetic Algorithm<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 20 | Course Name: Machine Learning using Python<br>Topic: Deep learning concepts | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the basic concept of Deep Learning<br>b. Understand Classification and Prediction<br>c. Grasp the significance of Text Identification |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- What is Deep learning?<br>- Knowledge of classification and Prediction<br>- What are different performance metrics?<br><br>- **Development** (30 minutes)<br>- Overview of Deep Learning<br>- Overview of Classification<br>- Type of Classification<br>- Overview of Prediction<br>- Overview of Text Identification<br>- Introduction to Scikit Learn<br>- Installation<br>- Features<br>- Advantages and Disadvantages<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=aPfkYu_qiF4&list=PLyqSpQzTE6M9gCgajvQbc68Hk_JKGBAYT<br><br>3. Reference website:<br>https://aws.amazon.com/what-is/deep-learning/<br><br>Suggested Reading books:<br>Hands-On Machine Learning with Scikit-Learn, Keras, and Tensor Flow by Aurelian Géron |

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| | Homework<br>Explore Deep Learning Tools:<br>• Tensor flow<br>• Theano<br>• Keras<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Deep Learning, Classification, Predictive and Scikit Learn<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 21 | Course Name: Machine Learning using Python<br>Topic: Working with Python | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the basic concept and features of built-ins<br>b. Install and work with Python<br>c. Analyze the advantages of the language |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Python, its implementation, working and comparison with other languages<br><br>- **Development** (30 minutes)<br>- Overview of Python<br>- Introduction to Python<br>- Application of language<br>- About Installation and working<br>- Components of python windows<br>- Python Programming interactive mode<br>- Use of Interpreter<br>- IDLE<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>3. https://www.youtube.com/watch?v=bHstZAcEbrI&list=PLqftY2uRk7oXvERQEgATSr-KzAh8WLW_D&index=20<br><br>4. Reference website: https://www.geeksforgeeks.org/download-and-install-python-3-latest-version/<br><br>Suggested Reading books:<br>Core Python Programming by R. Nageswara Rao<br><br>Homework<br>Write the statement next on the python prompt using the print() |

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| | function to get the following output:<br>• Python works in two modes: Interactive Mode and Script mode.<br>• Interpreter is a language processor<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Python Installation<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 22 | Course Name: Machine Learning using Python<br>Topic: Data Types in python | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the basic concept and features of built-ins<br>b. Articulate the Data Types in python<br>c. Appreciate the advantages of Data types |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Pre requisites:<br>- Understanding how to declare and assign values to variables.<br>- Familiarity with arithmetic, comparison, and logical operators.<br><br>- **Development** (30 minutes)<br>- Overview of Data Types<br>- Basic Data Types:<br>• Text Type: str<br>• Numeric Types: int, float, complex<br>• Sequence Types: list, tuple, range<br>• Mapping Type: dict<br>• Set Types: set, frozenset<br>• Boolean Type: bool<br>• Binary Types: bytes, bytearray<br>• Overview of Python Operators<br>• Overview of Data Handling<br>• Program<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=9uh9LU5ZZbs&t=419s<br><br>3. Reference website:<br>https://www.geeksforgeeks.org/python-data-types/<br><br>Suggested Reading books:<br>Core Python Programming by R. Nageswara Rao |

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| | Homework<br>a)Create a program to calculate a 5% discount on the total purchase of stationery<br>b) Create a program in Python to convert miles into kilometres<br>1 Miles= 1.6 Kilometers<br>c) What are literals? How many types of literal are available in Python?<br>d) What are List and Tuple data types of Python?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Data Type, List, Tuples, Operators<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 23 | Course Name: Machine Learning using Python<br>Topic: Sets and Mapping in python | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the basic concept and features of built-ins<br>b. Articulate the concept of Sets and Mapping<br>c. Appreciate the advantages of Sets and Maps |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Explain the concept of sets as unordered collections of unique elements.<br>- Discuss the differences between sets and lists/tuples (unorderness, uniqueness)<br><br>- **Development** (30 minutes)<br>- Overview of Sets<br>- The basic concept of Sets<br>- Access item<br>• Adding items<br>• Get the length of Set<br>• Remove items<br>• Join Sets<br>- About Frozen Sets<br>• Overview of Mapping Types<br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=KrPifJU8k7U<br><br>3. Reference website:<br>https://www.w3schools.com/python/python_sets.asp<br><br>Suggested Reading books:<br>Core Python Programming by R. Nageswara Rao<br><br>Homework<br>a) When would you use a frozen set instead of a regular set?<br>b) Write a Python script to generate and print a dictionary that |

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| | contains a number (between 1 and n) in the form(x,x*x).<br>Sample Dictionary(n=5)<br>Expected Output:{1:1,2:4,3:9,4:16,5:25}<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Sets and Mapping<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 24 | Course Name: Machine Learning using Python<br>Topic: Tuples in python | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the basic concept and features of Tuples in Python<br>b. Learn how to create and access elements within a tuple.<br>c. Explore the immutability property of tuples. |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Explain the concept of sets as unordered collections of unique elements.<br><br>- **Development** (30 minutes)<br>- What are Tuples?<br>- Introduce tuples as an ordered, immutable collection of elements.<br>- Compare and contrast tuples with lists (mutable).<br>- Create Tuple With One Item<br>- Tuple Items - Data Types<br>- Access Tuple Items<br>- Negative Indexing<br>- Range of Indexes<br>- Change Tuple Values<br>- Remove elements<br>- Join Two Tuples<br><br>- **Exercise** (10 minutes) –<br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=mzx74TdGYbg&t=3s<br><br>3. Reference website:<br>https://www.w3schools.com/python/python_tuples.asp<br><br>Suggested Reading books:<br>Core Python Programming by R. Nageswara Rao<br><br>Homework<br>1) What is a tuple in Python? |

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| | 2) How does it differ from a list?<br>3) How do you create an empty tuple?<br><br>4) How do you create a tuple with a single element?<br>5) How do you access the elements of a tuple?<br><br>6) Explain the use of indexing and slicing.<br>7) Why are tuples considered immutable?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Tuples<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 25 | Course Name: Machine Learning using Python<br>Topic: List in python | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the basic concept and features of List in Python<br>b. Learn how to create and access elements within a List<br>c. Explore common list methods and operations. |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Explain the concept of Tuples and sets as unordered /ordered collections of unique elements.<br><br>- **Development** (30 minutes)<br>- What are Lists?<br>-Introduce lists as an ordered, mutable collection of elements.<br>-Explain that lists can hold elements of different data types.<br>- Why use Lists?<br>- Discuss the advantages of lists:<br>- Flexibility (mutable)<br>- Versatility (can store various data types)<br>- Widely used in many programming tasks<br>- Creating list<br>- List length<br>- Access List Items<br>- Negative Indexing<br>- Range of Indexes<br>- Check if item exists<br>- Change item Values<br>- Insert item<br>- Append item<br><br>- **Exercise** (10 minutes) –<br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=9kNDT-0yAEM&t=4s<br><br>3. Reference website:<br>https://www.w3schools.com/python/python_lists.asp |

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| | Suggested Reading books:<br>Core Python Programming by R. Nageswara Rao<br><br>Homework<br>What is a list in Python?<br>How does it differ from a tuple?<br>How do you create an empty list?<br><br>How do you create a list with some initial values?<br>How do you access elements within a list?<br><br>Explain the use of indexing and slicing.<br>How can you modify a list in Python?<br><br>Give examples of list methods for adding, removing, and modifying elements.<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on List in Python<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 26 | Course Name: Machine Learning using Python<br>Topic: Dictionary in python | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Understand the concept of dictionaries in Python.<br>b. Learn how to create, access, and modify dictionaries.<br>c. Explore common dictionary methods and operations. |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Explain the concept of Tuples and sets as unordered /ordered collections of unique elements.<br><br>- **Development** (30 minutes)<br>- What are Dictionaries?<br>- Introduce dictionaries as an unordered collection of key-value pairs.<br>- Explain that keys must be unique and immutable (e.g., strings, numbers, tuples).<br>- Discuss the flexibility of storing different data types as values.<br>- Why use Dictionary<br>- Discuss the advantages of Dictionary<br>- Creating Dictionary<br>- Dictionary length<br>- Access Dictionary<br>- Get keys<br>- Get values<br>- Update Dictionary<br>- Removing items<br>- POP item<br>- Copy Dictionary<br><br>- **Exercise** (10 minutes) –<br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=gT5zwOeleAM&t=1s<br><br>3. Reference website:<br>https://www.w3schools.com/python/python_dictionaries.asp |

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| | 4. Suggested Reading books:<br>Core Python Programming by R. Nageswara Rao<br><br>5. Homework<br>- What is a dictionary in Python?<br><br>- How does it differ from a list?<br>- How do you create an empty dictionary?<br><br>- How do you create a dictionary with some initial key-value pairs?<br>- How do you access the value associated with a specific key in a dictionary?<br><br>- What happens if you try to access a key that doesn't exist?<br>- How can you add or update a key-value pair in a dictionary?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Dictionary in Python<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 27 | Course Name: Machine Learning using Python<br>Topic: Arrays in python | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Understand the concept of arrays and their advantages over Python lists.<br>b. Explore basic array operations and methods. |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Explain the concept of Tuples and sets as unordered /ordered collections of unique elements.<br><br>- **Development** (30 minutes)<br>- What are Arrays?<br>- Introduce arrays as efficient data structures for numerical computations.<br>- Creating Arrays<br>- Access Arrays<br>- Reversing Arrays<br>- Copying Arrays<br>- Sort an array<br>- Removing element<br><br>- **Exercise** (10 minutes) –<br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=Y3Ri2GdYfYg<br><br>3. Reference website:<br>https://www.w3schools.com/python/python_arrays.asp<br><br>4. Suggested Reading books:<br>Core Python Programming by R. Nageswara Rao<br><br>5. Homework<br>- What is an array in Python?<br>- What is the primary data structure used for arrays in Python?<br>- How does it differ from a list?<br>- How do you create an array in Python? |

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| | - What module is typically used to work with arrays in Python?<br>- Provide an example of how to create an array of integers.<br>- How do you access elements in a Python array?<br>- Explain the use of indexing.<br>- Can you use negative indices with arrays?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Arrays in Python<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 28 | Course Name: Machine Learning using Python<br>Topic: Control Structures in python | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the concept of Control Structures<br>b. Understand the advantages of Control Structures |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Explain the concept of control flow in programming.<br>- Discuss how control flow statements alter the execution order of a program<br>-<br>- **Development** (30 minutes)<br>- Overview of Control Structures<br>- o About Conditional Branching<br>• If Condition Statement<br>• If-else Conditional Statement<br>• If-Elif Conditional Statement<br>- o About Looping Statement<br>• The for loop<br>• The while Loop<br>• Jump Statement<br>• Break<br>• Continue<br>- • Programs-<br><br>**Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://nptel.ac.in/courses/106106182<br><br>3. Reference website:<br>https://www.javatpoint.com/control-structures-in-python<br><br>Suggested Reading books:<br>Core Python Programming by R. Nageswara Rao<br><br>Homework |

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| | - What is the purpose of an if statement in Python?<br>- How do you use the else keyword in Python?<br>- Explain the elif statement and its use cases<br>- What are the two main types of loops in Python?<br>- When would you use a for loop over a while loop?<br>- How do you break out of a loop early?<br>- What is the purpose of the continue statement?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Control Structures in Python<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 29 | Course Name: Machine Learning using Python<br>Topic: Exception Handling in python | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Grasp the concept of Exception Handling<br>b. Explore different types of exceptions |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Introduce exceptions as errors that occur during program execution.<br>- Explain how exceptions can disrupt normal program flow.<br>- Examples:<br>- Division by zero<br>- Accessing an index out of bounds<br>- Type errors (e.g., trying to add a number to a string)<br>- **Development** (30 minutes)<br>- Different types of exceptions in python:<br>•SyntaxError<br>•TypeError<br>•NameError<br>•IndexError<br>•KeyError<br>•ValueError<br>•AttributeError<br>•IOError<br>•ZeroDivisionError<br>•ImportError<br>**Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=_d-F2kSAees<br><br>3. Reference website:<br>https://www.w3schools.com/python/python_try_except.asp<br><br>Suggested Reading books:<br>Core Python Programming by R. Nageswara Rao |

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| | Homework<br>- What is an exception in Python?<br>- Give some examples of common exceptions.<br>- What are custom exceptions in Python?<br>- How do you create a custom exception class?<br>- How can exception handling improve the robustness and maintainability of your code?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Exception Handling in Python<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 30 | Course Name: Machine Learning using Python<br>Topic: Deep learning concepts | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the basic concept of Deep Learning<br>b. Understand Classification and Prediction<br>c. Grasp the significance of Text Identification |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- What is Deep learning?<br>- Knowledge of classification and Prediction<br>- What are different performance metrics?<br><br>- **Development** (30 minutes)<br>- Overview of Deep Learning<br>- Overview of Classification<br>- Type of Classification<br>- Overview of Prediction<br>- Overview of Text Identification<br>- Comparison between Classification and Prediction<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=aPfkYu_qiF4&list=PLyqSpQzTE6M9gCgajvQbc68Hk_JKGBAYT<br><br>3. Reference website:<br>https://aws.amazon.com/what-is/deep-learning/<br><br>Suggested Reading books:<br>Hands-On Machine Learning with Scikit-Learn, Keras, and Tensor Flow by Aurelian Géron<br><br>Homework<br>- What is the difference between classification and prediction?<br>- Discuss classification with examples.<br>- Elaborate prediction with examples. |

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| | Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Deep Learning, Classification, Prediction.<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 31 | Course Name: Machine Learning using Python<br>Topic: Python Standard Library | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the basic concept of Modules and Packages<br>b. Grasp the concept of Python Standard Library<br>c. Analyze the advantages of Modules and Packages |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- Explain the concept of modularization in programming.<br>- Discuss the benefits of using modules and packages, such as code reusability, organization, and maintainability<br><br>- **Development** (30 minutes)<br>- Overview of Modules<br>• Structure of a Python Module<br>• Importing modules in a python program<br>• Overview of Python Library<br>• Python Built-in Function<br>• Working with standard library Modules<br>• Using Random Module<br>• Using URL lib and Web browser Modules<br>• Creating a python library<br><br>**Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=oHaYdfWlgCg&list=PLh2mXjKcTPSACrQxPM2_1Ojus5HX88ht7&index=12<br><br>3. Reference website:<br>https://www.geeksforgeeks.org/libraries-in-python/<br><br>Suggested Reading books:<br>Core Python Programming by R. Nageswara Rao<br><br>Homework |

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| | a) WAP to get http request information from URL www.ted.com and open it from within your program.<br>b) What is a module, package and a library?<br>c) What is the utility of built-in function help()?<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Modules and Packages<br>Spend 5 minutes to evaluate student assimilation of the lesson contents |

| Lesson Plan No. 32 | Course Name: Machine Learning using Python<br>Topic: Deep learning-Tools and Platforms | Course No.: MCA 303 |
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| **Objectives** | At the end of the lesson the student shall be able to:<br>a. Articulate the basic concept of Deep Learning- Tools and Platforms<br>b. Understand the features and installation of Scikit<br>c. Grasp the significance and features of Tensorflow |
| **Teaching Aids (if any)** | a. Power point presentation |
| **Teaching Development** | - **Introduction** (5 minutes)<br>- Ask questions.<br>- What is Deep learning?<br>- What are different libraries?<br><br>- **Development** (30 minutes)<br>- Understand the core concepts of TensorFlow and Keras.<br>- Learn how to install and import necessary libraries.<br>- Create and manipulate Tensors.<br>- Introduction to Scikit Learn<br>- Installation<br>- Features<br>- Advantages and Disadvantages<br><br>- **Exercise** (10 minutes) –<br><br>Group Discussion at the end of the session.<br>Question and Answer session in between the lesson to check the presence of mind of students. |
| **Closure** | 1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.<br><br>2. Suggested video lecture<br>https://www.youtube.com/watch?v=aPfkYu_qiF4&list=PLyqSpQzTE6M9gCgajvQbc68Hk_JKGBAYT<br><br>3. Reference website:<br>https://aws.amazon.com/what-is/deep-learning/<br><br>Suggested Reading books:<br>Hands-On Machine Learning with Scikit-Learn, Keras, and Tensor Flow by Aurelian Géron<br><br>Homework<br>Explore Deep Learning Tools:<br>• Tensor flow |

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| | • Theano<br>• Keras<br><br>Spend 5 minutes to wrap up and consolidate the learnings |
| **Evaluation** | 1. Reflective Questions (What, why, Who?). Allow students to answer and discuss.<br>2. Quiz on Deep Learning- Tools and Platforms<br><br>Spend 5 minutes to evaluate student assimilation of the lesson contents |