

# Sunbeam Modular Courses – Complete Syllabus

## COURSES

### Target Audience:

Data Engineers, Python Developers, Freshers

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### Syllabus:

#### Section 1: Spark Architecture & Internals

- Distributed Computing Fundamentals
- RDD lineage, DAG scheduler, lazy evaluation
- Cluster managers overview
- Spark 4.x Updates
- Adaptive Query Execution (AQE) enhancements
- Catalyst optimizer improvements
- Performance Tuning
- Joins
- Partitioning, broadcast variables
- Memory management

#### Section 2: PySpark DataFrames & SQL

- Data Manipulation
- Complex types (JSON, arrays, maps)
- Window functions, pivot tables, UDFs/Pandas UDFs
- Spark SQL Deep Dive
- Temp views, catalog API, Hive metastore integration
- SQL syntax for Delta Lake operations
- Execution Plans
- Reading ``explain()`` output
- Predicate pushdown, partition pruning

#### Section 3: Incremental Data Processing & Apache Kafka

- Structured Streaming
- Event-time processing, watermarking, state management
- Kafka integration (source/sink)
- Delta Lake Essentials
- ACID transactions
- Schema evolution

#### Section 4: Spark Optimizations

- Catalyst Internals
- Logical vs. physical plans
- Custom optimization extensions
- Performance Best Practices
- File formats (Parquet/Delta)
- Resource allocation (executors/cores)

#### Section 5: Databricks Lakehouse Platform

- Lakehouse fundamentals
- Workspace Navigation
- DBFS, clusters, notebooks
- Delta Lake UI
- Viewing table history/schema
- Data Governance
- Unity Catalog basics (no Admin tasks)

#### Section 6: Apache Kafka Fundamentals

- Architecture
- Brokers, topics, partitions, consumer groups
- Spark-Kafka Integration
- Structured Streaming with Kafka
- Job execution

#### Section 7: Spark ML Introduction

- MLlib Workflow
- Transformers vs. estimators, pipelines
- Feature engineering (VectorAssembler, StringIndexer)
- Model Training
- Regression demo (no hyperparameter tuning)

#### Section 8: Capstone Project

- Pipeline implementation
- Domain Examples: IoT monitoring, retail analytics

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## Prerequisites:

1. Python: Language Fundamentals, Functions, Collections, Pandas, ...
2. SQL: CRUD Operations, Group By, Joins, Analytical queries,
3. Good to have: Linux basics, Hadoop/Hive knowledge beneficial

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## Tools & Setup:

- Local Installation: Spark 4.x, Java 11, Python 3.10
- Cloud: Databricks Community/Free Edition

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## Outcome:

Master PySpark DataFrames/SQL for batch & stream processing

Build optimized pipelines using Catalyst insights

Understand Spark job execution internals

Understand Apache Kafka and Integrate with Spark

Hands-on implementation of capstone project

Certification-ready skills

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## Important Notes:

1. Developer-Centric Focus:

- Covers PySpark application development (coding, debugging, optimization).
- Excludes: Cluster administration, infrastructure setup (YARN/K8s), or Spark cluster tuning.

2. Machine Learning Scope:

- Only introductory-level Spark ML (pipeline structure, basic concept).
- Excludes: Advanced ML concepts (hyperparameter tuning, etc), DL frameworks, or MLOps.

3. Language & Environment:

- PySpark (Python API) only Scala/Java/R APIs not covered.
- Databricks usage focuses on developer work, not account/admin management.

4. Kafka Integration:

- Covers Spark-as-Consumer/Producer not professional Kafka cluster setup, security, or Streams API.

5. Infrastructure Assumptions:

- All labs use local/standalone mode or Databricks Community Edition.

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## Video Availability till date:

17th Nov 25

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## Batch schedule

Sr.No

Batch Code

Start Date

End Date

Time

1

Spark-O-04

16-Aug-2025

17-Sep-2025

7:00 PM To

9:00 PM

Schedule : Mon-Sat

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# COURSES

## Target Audience:

Students  
Fresher's  
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## Course Contents:

English - (nouns,pronouns,verbs,adjectives,adverbs,prepositions,conjunction,articles,Tenses, Voice,Direct Indirect Speech, Idioms, Synonyms & Antonyms, Reading Comprehension )  
Reasoning - (Analogy, Coding and Decoding, Syllogism, Blood Relations, Seating Arrangements, Puzzles, Directions, Data Sufficiency, Numerical Series, Ranking & Ordering)  
Quantitative - (Number System, Percentage, Profit and Loss, Ratio & Proportion, Partnership, Average, Ages, Mixture & Alligation, Simple Interest & Compound Interest, cyclicity and remainder, Time Speed & Distance, Trains Boats & Streams, Time & Work, Wages (man Days), Pipes & Cisterns, Permutations & Combinations, Probability, Problems on Ages, Surds And Indices)  
Test Series  
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## Recorded Videos:

Recorded videos will be accessible for up to 7 Days from the date of upload.  
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## Batch schedule

Sr.No  
Batch Code  
Start Date  
End Date  
Time  
1  
Aptitude-O-02  
02-Feb-2026  
23-Feb-2026  
6:00 PM To  
9:00 PM  
Schedule : Mon - Fri  
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# COURSES

## Target Audience:

Students  
Fresher's  
Working professionals  
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## Pre-requisites:

C Programming  
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## Syllabus:

C++ Introduction  
Namespace  
C++ Language Features  
Exception Handling  
OOPS Concepts  
Dynamic Memory Allocation, Destructor & Copy Constructor  
Friend Function & Operator Overloading  
How To Share Data Between Objects  
Inheritance & Polymorphism  
Virtual Function, Abstract Class & Interface  
STL  
FILE I/O  
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## Batch schedule

Sr.No
Batch Code
Start Date
End Date
Time
1
CPP- O-07
23-Jan-2026
20-Feb-2026
5:00 PM To
8:00 PM

Schedule : Weekdays - (Mon-Fri)

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# COURSES

## Target Audience:

Students

Fresher's

Working professionals

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## Syllabus:

Java Language Fundamentals

Java language features

Overview of JDK, JRE and JVM

Data types and wrapper classes

Package, path and classpath

Arrays, Enum, jar file

OOPs Concept

Class, reference, instance

Constructor chaining

Object class

Static initializer block

Association and inheritance

Polymorphism and dynamic method dispatch

Abstract class and Interface

Exception Handling

Error and exception

Checked and unchecked Exception

Try-with-resource

Multi-catch block

Custom exception

Chained exceptions

Functional Programming Fundamentals

Nested and local class

Anonymous inner class

Functional interface

Lambda expression

Method and constructor references

Constructor Reference

Generics

Boxing/Auto-Boxing and Unboxing/Auto-Unboxing

Parameterized type

Bounded type parameter  
Wild Card and its type  
Generic method  
String Handling  
Overview of UNICODE  
String, StringBuffer and StringBuilder  
StringTokenizer  
Regular expression  
Collection Framework  
Comparable versus Comparator  
List, ArrayList, Vector  
Set, TreeSet  
Hashing  
HashSet, Hashtable and HashMap  
Java 8 Streams  
Multithreading  
Advantages & issues of process & thread  
Thread class and Runnable  
Thread States, life cycle  
Race condition, deadlock, monitor  
Synchronization and Object class  
File IO  
Path basics  
Text file and binary file processing  
Serialization and deserialization  
SerialVersionUID  
Reflection  
Metadata and its application  
java.lang.Class class  
Overview of reflection classes and interfaces  
Dynamic method invocation  
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## **Pre-requisites:**

OOP concepts: Class, Object, overloading, constructor, inheritance and virtual function.  
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## **Software Setup:**

SDK: Open JDK 1.8  
Editor: MS VS Code  
IDE: Eclipse

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## Student Feedback:

Rohan Parmane: Your dedication and passion for teaching truly shine through in every lesson. Your ability to engage students and make complex concepts understandable is impressive. The positive environment you create in the classroom fosters both learning and growth. Keep up the excellent work. Your thoughtful approach and dedication are greatly appreciated by me.

Ketan Kore: I've had the pleasure of learning Core Java under the tutelage of Sir, and I must say that he's the best mentor I've had. Their thorough understanding of Java fundamentals, combined with their ability to present complex topics in a straight forward and understandable manner, has been quite helpful in my learning process.

Ketan Kore: Your explanations are always clear and well-structured, which helps grasp difficult concepts more easily. Nice teaching, best interaction with us, great at doubt solving.

Rohan Parmane: excellent I will miss Sunbeam Teaching. Sir taught us very well. we got so much knowledge about java in just a little time. sir explained each concept very easily and understandably. Thank you sir for your valuable guidance.

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## Recorded Videos:

Recorded videos will be accessible for up to 7 Days from the date of upload.

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## Batch schedule

Sr.No

Batch Code

Start Date

End Date

Time

1

CJ-O-17

23-Jan-2026

20-Feb-2026

9:00 AM To

1:00 PM

Schedule : Weekdays - (Mon-Fri)

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# COURSES

## Target Audience:

Students  
Fresher's  
Working professionals  
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## Syllabus:

Algorithm Analysis:

Time complexity

Space complexity

Linked List:

Array advantages and disadvantages

Linked List concept

Linear Singly Linked List

Circular Singly Linked List

Linear and Circular Doubly Linked List

Complexity analysis of Linked List operations

Stack:

Stack concept

Stack using Array

Stack using Linked List

Expression conversion & evaluation (prefix, infix and postfix)

Parenthesis balancing

Complexity analysis of Stack operations

Queue:

Queue concept & types

Queue using Array

Queue using Linked List

Complexity analysis of Queue operations

Sorting:

Selection sort

Bubble sort

Insertion sort

Quick sort

Merge sort

Heap sort

Complexity analysis of sorting algorithms

Searching:

Linear Search

Binary Search

Hashing

Complexity analysis of searching algorithms

Tree:

Tree concept & types

Tree traversal (Inorder, Preorder and Postorder)

Binary Search Tree (BST) implementation

BST: add node, traversal, delete node, balancing, BFS & DFS.

Complexity analysis of BST algorithms

Graph:

Graph concept & types

Adjacency Matrix implementation

Adjacency List implementation

Spanning Tree algorithms: Prim's MST, Kruskal's MST

Shortest Path algorithms: Dijkstra, Bellman Ford, Warshall Floyd

Search algorithms: BFS, DFS, A\* search

Complexity analysis of Graph algorithms

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## **Pre-requisites:**

Java Programming: Class & Object, Generics, Java collections (Array list).

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## **Outcome:**

Understand common data structures (array, linked list, stack & queue) and their applications.

Learn advanced data structures (hashing, trees, heap & graphs) and their operations.

Implement data structures and algorithms using Java.

Revise fundamentals for Data structure interviews.

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## **Software Setup:**

Any IDE & compiler for Java

May use online editor

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## **Important Notes:**

Code along with trainer in live class.

Assignments will be given for self practice.

Line by line implementation of data structures in Java.

Corresponding C++ & Python codes will be shared.

Discussion of frequently asked interview questions.

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## Student Feedback:

Excellent Teaching, concept clearance and doubt clearing. Thank you sir for taking this wonderful session. Before this session I have only theory knowledge but now I am comfortable in code and logic also.

really enjoyed the approach of explaining DS. It was good. Cleared all the doubts which I have asked with no rush, maintained simplicity in teaching with each topics.

Abhilash Kamble

I don't owe my professional success to my destiny, courage, luck, belief, confidence or fortune. I owe it to a wonderful scholar like you. Nothing can come close to the inspirational presence of an instructor like you in a student's journey. You have no idea how important a role you play in shaping my research development, maybe we did not meet a lot, but those little encouragement words means a lot to me. I really enjoyed all of the readings and found they were diverse and inclusive. I learned a lot. Thank you for allowing us space to not only have dialogue but be creative within our assignments as well. I really learned some useful tips and tricks for DATA STRUCTURE AND ALGORITHMS which will help me in "Competitive Programming" as well. Thank you for being so encouraging and doing everything you can to keep us motivated and supported throughout our program. Your knowledge and leadership provide us with a priceless model for our own careers. Your diligence and direction have inspired my inner confidence to climb like a Tiger until I reach the pinnacle of my ambitions. One of the best decisions I had a fantastic time by taking your course in such Lock-Down period due to the COVID Pandemic. Thank you for loving your job so much! You are an amazing teacher!

Abhishek Verma

It was an amazing course as I imagined. Because of Nilesh sir's lecture, I got depth knowledge of data structure and I'm sure this is more than enough to build my upcoming career. Sunbeam provides the best facilities of video lectures too and because of this facility, I personally got many profits if I forgot any concept I goes through these lectures and it will help me to understand these concepts. The enthusiasm which sunbeam provides always gives us good fruit. Thank you Sunbeam.

Ashish Mishra

The way of your explanation is excellent. I have learned first time Data structure and Algorithms but never felt tough in understanding at any moment. All the contents of data structures and algorithms learned very well and easily. Thank you very much, sir.

Aniket Katte

First of all, thank you for sharing your precious knowledge in a very efficient manner because even if I'm from none IT background I understood all things expertly. I'm sure that it will be very helpful throughout my career. Thank you

Tejas Jadhav

The best thing about the course is that this course is very punctual about timing and syllabus. None of the single point is not skipped. and in learning time there is a motivated environment. Nilesh sir's way of teaching is awesome now I am big fan of sir. As I am a last year student many of the concepts is not cleared but after this course, I have that confidence that I am really good in DSA. Thank you Nilesh sir and Sunbeam Team.....!!!

Shubham Pate

all sessions are very well explained, understood very well, it will surely help me in dac course as data structure is a part of syllabus, the way of teaching was interesting, i enjoyed learning during course. Thanks a lot.

Bilal Pathan

Best approach to learn Ds is to learn through the basic and to learn basics is know basic .. the whole process by Nilesh sir made me understand Data structure in very simple way and to made an environment where we had an open discussion on of doubts without thinking whether to ask or not... Thanks a lot sir as beginner in data structure you have made me expert in ds what I need is now a paper work. So thanks a lot sir and thanks to vishal sir for helping me solve the basic problems.

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## Getting Started with DS...

[Course Highlight...](#)

[Time Complexity...](#)

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## Batch schedule

Sr.No

Batch Code

Start Date

End Date

Time

1

DSA-O-12

29-Jan-2026

20-Feb-2026

5:00 PM To

8:00 PM

Schedule : Weekdays - (Mon-Sat)

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# COURSES

## Syllabus

Week 1: Linux

DevOps

Introduction to DevOps

SDLC and Agile fundamentals

DevOps Lifecycle

Introduction to the Tools used in DevOps Lifecycle

Linux

Installation and configuration using VM

Booting

File System

Working with Text files

Archiving and compressing files

User and Group management

File Permissions

Package management

Systemd management

Week 2: Git

Foundation of VCS

What is Git?

Git Workflow

Git Internals

Demystifying branching

Collaboration with GitHub

Week 3: Docker

Virtualization

Hardware virtualization vs Containerization

Docker fundamentals

Architecture

Installation and configuration

Image management

Container management

Docker network

Persisting data with Docker volumes

Container Orchestration with Docker Swarm

Week 4: Kubernetes

Introducing Kubernetes and its features

Architecture

Installation of configuration of Kubernetes cluster  
Pod management  
Secrets and ConfigMaps  
Service and Networking  
State persistence with PersistentVolumes and PersistentVolumeClaims  
Observability  
Probes  
Week 5: Jenkins  
Introduction to CI/CD pipeline  
Jenkins cluster installation and configuration  
Configuration of pipeline  
Scripted pipeline  
Implementing security with Jenkins  
Setting up notifications  
Using Jenkinsfile  
Week 6: AWS  
Introduction to Cloud  
What is AWS?  
AWS Services  
Compute Services:  
EC2 instance  
VPC  
Lambda  
Storage Services: S3  
Database Services: RDS (MySQL)  
DevOps Services: CodeCommit, CodeBuild, CodeDeploy, X-Ray  
Container Services: ECS, EKS  
Week 7: Terraform  
Infrastructure as a Code  
Installation and Configuration  
Terraform foundation  
Workflow  
Terraform modules  
Implementing and maintaining states  
HCP Terraform  
Week 8: Ansible  
Introduction to Ansible  
Pull vs Push method  
Installation and Configuration  
Architecture and Design of Ansible  
Diving into playbooks  
Using Ansible with cloud  
Using Ansible with containers

Modules and plugins

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## Prerequisites

Basic Linux administration

Knowledge of any development stack

Knowledge of testing tools like Selenium and JUnit

Knowledge of build tools like Ant/Gradle/Maven

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## Diwali Vacation Break:

Diwali Holidays are scheduled from 17th October 2025 to 31st October 2025.

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## Batch schedule

Sr.No

Batch Code

Start Date

End Date

Time

1

Dev Ops-O-06

15-Sep-2025

20-Nov-2025

9:00 PM To

11:00 PM

Schedule : Mon - Thu

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## Prerequisite:

- Basic to intermediate Python programming (loops, functions, lists, dictionaries, basics of classes)
- Basic understanding of ML concepts (what a model, training, and loss mean)
- High-level math intuition: addition, subtraction, multiplication and division
- Familiarity with PyTorch or NumPy is helpful but not mandatory
- A laptop with 8 GB RAM (GPU recommended but not required)
- Curiosity and willingness to learn how LLMs work internally (not just use APIs)

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## Syllabus:

Introduction to LLM

What is large language model?

Types of LLM

Applications of LLM

Requirements of DreamLLM

Mathematics and Pytorch required for LLM

Vectors

Matrices

Tensors

Linear Algebra

All maths topics with Pytorch implementation

Introduction to Deep Learning

Difference between ML and DL

Neural network architecture

Introduction to forward and backward propagation

Why should you build DreamLLM?

Strategies of building LLM

Fine tuning vs creating custom LLM

Supervised (labelled) vs unsupervised (unlabelled) training custom LLM

Architecture of DreamLLM

Transformers

Relationship between LLM and transformer

Introduction to transformers

Transformer architecture

Types of transformers

Understanding data

Data requirements to train DreamLLM

Preprocessing the data

Tokenization  
Custom tokenization  
Embeddings basics  
Byte pair encoding  
Processing data using sequence modelling  
Introduction to RNN (LSTM and GRU)  
Introduction and requirement of attention mechanism  
Implementing attention mechanism  
Self attention mechanism  
Single head  
Multi head  
Creating LLM from scratch  
Deciding the layers, activation functions  
Implementing feed forward network  
Generating text using custom LLM  
Fine tuning for further tasks  
Fine tuning the DreamLLM on labelled data  
Fine tuning the DreamLLM on unlabelled data  
Evaluation of DreamLLM  
Deploying the DreamLLM  
Use AWS cloud for deployment  
Automate the deployment using AWS DevOps tools  
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## **Outcomes:**

Academic Outcomes

Theoretical Understanding

Deep knowledge of mathematical foundations (Linear Algebra, Probability & Statistics, Optimization).

Understanding key concepts in Machine Learning and Deep Learning.

In-depth knowledge of Transformer architectures, Attention Mechanisms, and their variants (GPT, BERT, T5).

Practical Skills

Proficiency in Python and the use of deep learning frameworks like TensorFlow and PyTorch.

Ability to implement, train, and fine-tune advanced neural network models.

Skills in data preprocessing, feature extraction, and handling large datasets.

Evaluation and Deployment

Knowledge of evaluation metrics for NLP models (BLEU, ROUGE).

Techniques for deploying LLMs in production environments using APIs and containerization tools (Docker, Kubernetes).

Professional Outcomes

Job Readiness

Enhanced employability in roles related to AI research, machine learning engineering, and NLP development.

Ability to tackle complex problems in natural language processing and develop innovative solutions

Research Capabilities - Skills to contribute to the field of AI and NLP through original research. -

Understanding of current trends, challenges, and opportunities in LLM development. -

Understanding of ethical considerations in AI and NLP, including bias mitigation, privacy, and data governance. - Commitment to developing AI solutions that are fair, transparent, and responsible.

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## Capstone project:

Project Overview

Project Name: DreamLLM

Objective: Develop a state-of-the-art Large Language Model (LLM) from scratch, focusing on innovation and advanced capabilities.

Scope: The project aims to create an LLM with the ability to understand, generate, and interpret human language.

Target Audience: Researchers, developers, and enthusiasts interested in advanced AI and NLP.

Note: For the sake of time and infrastructure, the LLM will be trained on the limited data. (For the real version of it, you may want to go for huge data which will cost more.)

Technical Requirements

Programming Language: Python (version 3.11) Deep Learning Frameworks:PyTorch

Software Tools:

Jupyter Notebook

Git for version control

Docker for containerization (optional, depending on the participants)

Kubernetes for deployment (optional, depending on scalability needs)

Libraries and Tools:

Numpy, Pandas (for data manipulation)

NLTK or SpaCy (for text preprocessing)

Matplotlib, Seaborn (for data visualization)

Hardware Requirements:

Own infrastructure

High-performance GPU(s)

Sufficient storage for large datasets

Adequate RAM (minimum 32 GB)???????

Google Colab with TPU or GPU support

Runpod

Functional Requirements

Model Architecture:

Transformer-based architecture with advanced attention mechanisms

Support for different variants (e.g., GPT, BERT, T5)

Pre-training and fine-tuning capabilities

Data Handling:

Data preprocessing pipeline (tokenization, embedding)

Large dataset support (e.g., Wikipedia, Common Crawl)

Training Process:

Distributed training for scalability

Hyperparameter tuning (learning rate, batch size, etc.)

Evaluation Metrics:

Language accuracy metrics (BLEU, ROUGE)

Performance benchmarks (e.g., GLUE tasks)

Inference and Deployment:

API-based deployment (RESTful or gRPC)

Real-time inference capabilities

User Interface:

Web-based interface for interacting with the model (optional)

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**Video recording will be available till 05 June 2026 on portal**

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## **Dream LLM — Course Overview**

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### **Batch schedule**

Sr.No

Batch Code

Start Date

End Date

Time

1

DreamLLM-O-01

05-Jan-2026

09-Feb-2026

9:00 PM To

11:00 PM

Schedule : Monday - Thursday

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# COURSES

## Course Highlights

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## Target Audience:

Students

Fresher's

Working Professionals

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## Syllabus:

Introduction to Machine Learning

Big picture of machine learning

Why machine learning is needed?

Types of machine learning

Challenges of machine learning

Creating machine learning pipeling

End-to-end process

Regression

Understanding statistical regression

Performing regression with

Simple linear regressison

Multiple linear regression

Support vector machine

Evaluating models using RMSE, MSE, MAE etc

Classification

Understanding need of classification

Classification vs regression

Performing classification with

Logistic regression

Support vector machine

Decision trees

K nearest neighbours

Evaluating models using AuC and RoC etc

Ensemble Learning

What is ensemble learning

Need of ensemble learning

Types of ensemble learning

Bagging  
Random forest  
Boosting  
Gradient boosting  
Xgboost  
Stacking  
Clustering  
Why clustering is needed?  
Performing clustering using  
Hierarchical clustering  
K meaning clustering  
Association Rule Mining  
Where association rule mining is needed  
Performing association rule mining using  
Apriori  
Dimensionality Reduction  
Introduction to feature extraction  
What is dimensionality reduction?  
Performing dimensionality reduction using  
PCA  
Introduction to Deep Learning  
What is deep learning?  
Introduction to artificial networking  
Introduction to TensorFlow and Keras  
Introduction MLPs with Keras  
Convolutional Neural Network  
Deep computer vision using CNN  
Introduction to images and convolutions  
CNN architecture  
Image classification using CNN  
Object detection using CNN  
Recurrent Neural Network  
Introduction to RNN  
Processing sequences using RNN  
Training RNN  
Forecasting time series using TensorFlow  
Naural language processing using RNN  
Representation Learning and GANs  
Introduction to autoencoders  
Stacked autoencoders  
Introduction to GAN  
Reinforcement Learning  
Introduction to reinforcement learning

Introduction to OpenAI gym  
Q-learning  
Deep Q-Learning  
Deploying model on cloud (AWS)  
Saving models  
Serving TensorFlow model  
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## **Pre-requisites:**

Python fundamentals  
Collections  
Functions  
Classes  
Decorators  
Packages  
Numpy  
Pandas  
Matplotlib  
Statistics fundamentals

Note: Training videos on important topics will be shared for your own practice

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## **Outcome:**

You will be able to understand when, where and how to use ML

You will be able to solve problems related to regression, classification, AI etc.

You will be able to create models which can be used in desktop and mobile applications

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## **Important Note:**

Course does not cover the following:

Python Programming Syntax, even though entire ML programming will be done in Python. (Join prerequisite course : python-development)

Statistics behind ML algorithms, however foundations of descriptive & inferential statistics are covered exclusively (Refer syllabus).

Web technologies, however serving ML model in the web application is covered.

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## **Software Setup:**

Python 3.x  
IDE: Pycharm

Packages: numpy, pandas, scikit, pytorch, keras, flask

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## Student Feedback:

The excellent teaching style and excellent understanding of teaching topics. What I like the most about the course is how Amit Sir helps to improve visualization of code using proper diagrams and images. Also, proper sequencing of sample examples helps to revise the topic in the future. It's good that sir gives more time on basic topics in the beginning so that the foundation is strong. Your knowledge and leadership provide us with a priceless model for our own careers. I am so happy you are part of my education. I learned to truly care about diversity and inclusion through your classes, and I hope now spread that message in a passionate but thoughtful way. You're awesome!

Amazing skill of teaching and a very well structured course for people to start to learn machine learning. The assignments are very good for understanding the practical side of machine learning. To all those thinking of getting in ML, this is a must-have course. Kindly continue these online sessions post COVID-19 pandemic. It's really helpful for those who cannot come to the institute due to timing issues /working out of Pune etc. but willing to learn from you all.

Thank You.

Kudos to Sunbeam and Amit Sir again, for conducting Machine Learning with Python course in such a great manner. Amit Sir teaching as always is very precise and he goes out of this schedule to answer and cover, each and every doubt of the students and the topic in the syllabus. The course was also extended by a week, so as to cover all the topics in a meticulous manner.

Thank you Amit Sir and Sunbeam once again :)

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## Batch schedule

Sr.No

Batch Code

Start Date

End Date

Time

1

ML-O-07

26-Oct-2023

28-Nov-2023

07:30 AM To

9:30 AM

Schedule : Weekdays - (Mon -Fri)

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# COURSES

## Course Introduction

Join Amit Kulkarni, an industry expert and certified AI specialist, as he walks you through the Mastering GenAI course at Sunbeam Pune. This program is designed to help you understand, build, and innovate with AI-powered solutions.

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## Syllabus:

Mastering AI Basics

Overview of Statistics

Definition and importance of statistics

Types of statistics: descriptive and inferential

Role of statistics in data science and machine learning

Basic statistical terminology (population, sample, parameter, statistic)

Sampling

Sampling methods

sampling distributions

Central Limit Theorem

Descriptive Statistics

Measures of central tendency (mean, median, mode)

measures of variability (range, variance, standard deviation)

skewness and kurtosis

Probability:

Basic concepts of probability, conditional probability

Bayes' theorem.

Random variables and probability distributions

Distributions:

Normal distribution

Binomial distribution

Poisson distribution

Uniform distribution

Hypothesis Testing:

Null and alternative hypotheses

Type I and Type II errors

P-values

Confidence intervals

Correlation Analysis:

Pearson correlation

Spearman's rank correlation

Time Series Analysis:

Trend analysis

Seasonality

Moving averages

ARMA models

ARIMA models

Data Visualization:

Importance of data visualization

Principles of effective data visualization

Common visualization techniques:

Histograms

Box plots

Scatter plots

Heatmaps

Bar charts

Data Preprocessing

Data cleaning and handling missing values

Data transformation (normalization, standardization)

Feature engineering and selection

Encoding categorical variables

Handling imbalanced datasets

Data splitting (training, validation, test sets)

Data augmentation techniques

Outlier detection and handling

Introduction to Machine Learning

Overview of machine learning

Types of machine learning:

supervised learning

unsupervised learning

reinforcement learning

semi-supervised learning

Applications of machine learning

Challenges and limitations of machine learning

Regression Analysis

Overview of regression analysis

Algorithms for regression:

Linear regression

Ridge regression

Lasso regression

Assumptions of regression analysis

Model evaluation metrics (R-squared, adjusted R-squared, RMSE, MAE)

Model interpretation and communication of results

Applications of regression analysis

## Classification

Overview of classification

Types of classification

Evaluation metrics for classification (Confusion matrix, accuracy, precision, recall, F1-score, ROC-AUC)

Algorithms for classification:

Decision trees

k-nearest neighbors (k-NN)

Naive Bayes

Ensemble methods (Bagging, Boosting, Stacking)

Hyperparameter tuning and model selection

Cross-validation techniques

Applications of classification

## Clustering

Overview of clustering

Types of clustering:

K-means clustering

Hierarchical clustering

Evaluation metrics for clustering (Silhouette score)

## Dimensionality Reduction

Overview of dimensionality reduction

Importance of dimensionality reduction

Techniques for dimensionality reduction:

Principal Component Analysis (PCA)

Mastering-AI-Advance

Introduction to Deep Learning

Overview of deep learning

Differences between traditional machine learning and deep learning

Applications of deep learning in various domains

Challenges and limitations of deep learning

Overview of generative AI

Applications of generative AI in various domains

Challenges and limitations of generative AI

Deep Learning Frameworks

Overview of popular deep learning frameworks (TensorFlow, PyTorch, Keras)

Overview of generative AI frameworks (Huggingface, Langchain)

Setting up the environment

Artificial Neural Networks (ANNs)

Feedforward neural networks

what is a perceptron

Multi-layer perceptrons (MLPs)

Activation functions (ReLU, sigmoid, tanh)

Loss functions (mean squared error, cross-entropy)

Regression and classification using ANNs

Model evaluation metrics (accuracy, precision, recall, F1-score)

Model interpretability

Applications of ANNs in real-world scenarios

Hands-on: Build and train ANN model for regression and classification tasks

Convolutional Neural Networks (CNNs)

Overview of CNNs and their architecture

Convolutional layers and filters

Pooling layers (max pooling, average pooling)

Flattening and fully connected layers

Applications of CNNs in image processing and computer vision

Hands-on: Build and train a CNN for image classification

Recurrent Neural Networks (RNNs)

Overview of RNNs and their architecture

ANN vs CNN vs RNN

Long Short-Term Memory (LSTM) networks

Gated Recurrent Units (GRUs)

Applications of RNNs in natural language processing and time series analysis

Hands-on: Build and train an RNN for text classification or time series prediction

Generative Adversarial Networks (GANs)

Overview of GANs and their architecture

Generator and discriminator networks

Training GANs and challenges

Applications of GANs in image generation and data augmentation

Variants of GANs (DCGAN, CycleGAN, StyleGAN)

Hands-on: Build and train a GAN for image generation

Transfer Learning

Overview of transfer learning

Fine-tuning pre-trained models

Applications of transfer learning in various domains

Hands-on: Fine-tune a pre-trained model for a specific task

Natural Language Processing (NLP)

Overview of NLP and its applications

Text preprocessing techniques (tokenization, stemming, lemmatization)

Word embeddings (Word2Vec, GloVe, FastText)

Sequence-to-sequence models

Attention mechanisms in NLP

Named Entity Recognition (NER)

Sentiment analysis

Fine-tuning pre-trained models for NLP tasks

Hands-on: Build and train an NLP model for text classification or sentiment analysis

Large Language Models (LLMs)

Overview of LLMs and their architecture

Transformer architecture

Attention mechanisms

Pre-training and fine-tuning LLMs

Applications of LLMs in natural language processing

Hands-on: Fine-tune a pre-trained LLM for text generation or classification

Retrieval-Augmented Generation (RAG)

Overview of RAG

How RAG works

Applications of RAG in natural language processing

Challenges and limitations of RAG

Future directions of RAG

Hands-on: Build a RAG model for a specific task (e.g., chat with PDF, chat with CSV, chat with text)

Evaluation metrics for RAG models

Hands-on: Evaluate the performance of a RAG model

Agentic RAG

Overview of agentic RAG

How agentic RAG works

Applications of agentic RAG in natural language processing

Challenges and limitations of agentic RAG

Future directions of agentic RAG

Hands-on: Build an agentic RAG model for a specific task

Fine tuning LLMs

Overview of fine-tuning LLMs

How to fine-tune LLMs

Applications of fine-tuning LLMs in natural language processing

Challenges and limitations of fine-tuning LLMs

Future directions of fine-tuning LLMs

Hands-on: Fine-tune an LLM for a specific task

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## **Prerequisites:**

Beginners with basic python knowledge

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## **Student Feedback:**

Amit Kulkarni Sir is truly the best in this field. He explains the basics of technology, which is rare, and makes difficult concepts easy to understand. His syllabus is market-oriented, covering the latest trends.

Amruta Deole, Senior Software Developer

The hands-on projects, prompt engineering techniques, and deployment strategies were especially valuable. A great choice for both freshers and professionals aiming to upskill in Gen AI.

Rahul Kulkarni, Data Analyst & ML/DL Developer

Amit Sir answered thousands of questions with a smile. His passion for teaching and deep expertise inspired me. The sessions were technically sound and full of real-world insights.

Sanket Gawali, Solution Developer

The course provided a strong foundation, progressing seamlessly from basics to advanced topics like RAG and LLMs. The balance of theory and practice was perfect.

Shivani Bhinge, Associate Data Science Engineer

This was a zero-to-hero Generative AI course. I can now make an impact in my work using AI. Amit Sir's humility and support even after the course are unparalleled.

Chaitanya Takalikar, Software Engineer

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## Batch schedule

Sr.No

Batch Code

Start Date

End Date

Time

1

AI-O-002(Combo A+B)

14-Jul-2025

03-Sep-2025

9:00 PM To

11:00 PM

2

Mastering-AI-Basics-O-01(A)

14-Jul-2025

06-Aug-2025

9:00 PM To

11:00 PM

3

Mastering-AI-ADV-O-01(B)

07-Aug-2025

03-Sep-2025

9:00 PM To

11:00 PM

Schedule : Mon - Thu

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# COURSES

## Syllabus

### NODE

Introduction

what is node

advantages and limitations

Environment setup

install node

create a new project

configure project properties

debugging node application

### Basics

introduction to npm

introduction to package.json

importing npm modules

command line arguments

node async vs sync

threading model

microservices

introduction to microservices

developing microservices using js

configuration

deployment

### Http

creating web server

calling REST apis

### Express

introduction to express

create new project

express routes and router

middleware

connecting to database

adding authentication

### Node modules

file system

buffer

express

crypto-js

multer

mysql2  
postgres  
moment  
passport  
morgan  
React  
Setting up environment  
installing nodejs  
installing and configuring babel  
installing and configuring webpack  
Introduction to SPA  
what is single page architecture?  
SPA architecture  
Pros and Cons  
other SPA frameworks  
React fundamentals  
introduction to components  
component oriented architecture  
what components ?  
environment setup for react and react native  
build workflow  
React basics  
hello world react app  
creating functional component  
creating dynamic output  
component lifecycle  
debugging react application  
working with props  
styling react component  
Introduction to state management  
rules of state management  
initializing state through constructors  
updating state properties  
app lifecycle  
handling errors  
Introduction to Redux  
why redux?  
pros and cons  
redux architecture  
actions  
store  
reducers  
Advanced Redux concepts and integration

connecting react to redux  
mapStateToProps  
mapDispatchToProps  
async in redux  
async status and error handling  
Basic and advanced Routing  
introduction to routing  
root level routing  
child level routing  
React hooks  
what is hook?  
rules of hook  
using state hook  
using effect hook  
building custom hook  
Handling online payment  
connecting react with online payment gateway  
Testing React components  
testing overview  
setting up environment  
testing react components  
Click to Register

## **Pre-requisites:**

Object Oriented Programming Concepts  
Any RDBMS (SQL)  
Web Programming Fundamentals (HTML, CSS, JS)  
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## **Batch schedule**

Sr.No  
Batch Code  
Start Date  
End Date  
Time  
1  
MERN-O-03  
02-Jun-2025  
03-Jul-2025  
09:00 PM To  
11:00 PM

Schedule : Mon-Thu

[Click to Register](#)

# COURSES

## Prerequisites:

Python Libraries: numpy, pandas, matplotlib, sci-kit learn, pytorch

SCM: git

CI/CD Pipeline:

Jenkins and GitHub Actions: scripted pipeline configuration

Containerization:

Docker: installation and configuration, building custom images, containers, volumes, networks, port forwarding

Container Orchestration:

Kubernetes: cluster management, namespaces, pods, policies, services, configmap, secrets, networking, storage, autoscaling

Cloud:

AWS: EC2, ELB, Autoscaling, VPC, S3, Lambda, DevOps on AWS

Infrastructure as a code:

Terraform: AWS infrastructure management

Model building using scikit-learn and pytorch or tensorflow

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## Syllabus:

Experiment Tracking: MLFlow, Weights and Biases

Data and model versioning: dvc and LakeFS

Containerization of models: Docker

MLOps Pipeline: KubeFlow and MLFlow

Model serving: KServe, Tensorflow Serving

CI/CD for MLOps: Jenkins and GitHub Actions

Observability: ELK

Monitoring: Prometheus and Grafana

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**Video recording will be available till 05 March 2026 on SunBeam Portal**

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## Batch schedule

Sr.No

Batch Code

Start Date

End Date

Time

1

MLOps and LLMOps (O-01)

24-Nov-2025

05-Dec-2025

9:00 PM To

11:00 PM

Schedule : Monday to Friday (9pm to 11pm)

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# COURSES

## Prerequisite:

Any programming language

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## Highlights:

Live hands-on approach

Builds foundation for Machine Learning/Data science

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## Syllabus:

Python Fundamentals and Environment Setup

Introduction to Python

Applications of Python in Machine Learning, Backend, Automation

Installing Python on Windows, macOS, Linux

Python interpreters and virtual environments

Running Python programs

Script mode vs interactive mode

Basic coding standards and best practices

Core Python Syntax and Data Types

Variables and naming conventions

Built-in data types: int, float, complex, bool, string

Type conversion and type checking

Input and output operations

Understanding Python memory basics

Control Flow and Decision Making

if, elif, else statements

Nested conditions

Logical and comparison operators

Real-world decision-making examples

Loops and Iterations

for loop

while loop

range function

break, continue, pass

Nested loops

Common looping patterns

Python Data Structures

Lists

Creation, indexing, slicing

List operations and methods

List comprehensions

Tuples

Tuple creation

Tuple vs list

Use cases and immutability

Sets

Set creation

Set operations

Mathematical set concepts

Dictionaries

Key-value pairs

CRUD operations

Nested dictionaries

Handling JSON-like data

Strings and Text Processing

String operations

Common string methods

String formatting using f-strings

Text manipulation and cleaning basics

Functions and Modular Programming

Defining and calling functions

Function arguments: positional, keyword, default  
args and kwargs

Return values

Scope: local and global

Creating reusable modules

Object-Oriented Programming in Python

OOP concepts and importance

Classes and objects

Constructors

Instance variables and class variables

Methods

Encapsulation

Inheritance

Polymorphism

Introduction to magic methods

Real-world OOP examples

Error Handling and Debugging

Types of errors in Python

try, except, else, finally

Creating custom exceptions  
Debugging techniques  
Writing robust code  
File Handling and Data Input Output  
Reading and writing text files  
Working with CSV files  
Working with JSON files  
File handling best practices  
Introduction to logging  
Working with Dates, Time and Utilities  
Datetime module  
Time module  
Date formatting and parsing  
Timestamps and timers  
Python Standard Library Overview  
os and sys modules  
math and random modules  
collections module  
itertools introduction  
Useful built-in functions  
Introduction to Data Handling for Machine Learning  
Importance of data in ML  
Introduction to NumPy: Arrays and vectorized operations  
Introduction to Pandas: DataFrames and Series  
Reading datasets  
Basic data exploration and cleaning  
Python for Backend Development Foundations  
Role of Python in backend systems  
Basics of HTTP and REST APIs  
Introduction to Flask and FastAPI concepts  
Request and response lifecycle  
JSON handling in backend  
Basic database interaction concepts  
Database connectivity  
Introduction to MySQL and SQLite  
Database design basics (tables, rows, columns, keys)  
CRUD operations using SQL  
Connecting Python with databases  
Using Python database connectors  
Executing queries from Python  
Handling database transactions  
Error handling in database operations

Mini Project

Data-oriented mini project for ML foundation

Backend-oriented mini project using Python logic

Emphasis on clean code and problem-solving

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## Student Feedback:

The course content was well-structured and covered all the essential topics needed to build a solid foundation in Python programming. What stood out the most for me was the clarity with which the concepts were explained. Sir went above and beyond by covering additional topics that were incredibly valuable. I now feel much more confident in my Python skills, thanks to this course.

I can genuinely say it was one of the most enriching learning experiences I've had. I was referred by a colleague to join SUNBEAM, I wasn't entirely sure what to expect initially, but from the very first session, it became clear that I was in the hands of an exceptional teacher. Sir has an extraordinary talent for simplifying even the most complex Python concepts, making them easy to grasp for all students.

His explanations are consistently clear, and he demonstrates remarkable patience, ensuring that every question is answered thoroughly and that no one is left behind. What truly stood out to me was his practical approach to teaching beyond just theory, he provided real-world examples that made it easy to see how Python could be applied in my professional work. Sir's dedication to his students is truly admirable.

I now feel confident in my Python skills and am eager to apply what I've learned in my career. His teaching style, depth of knowledge, and unwavering support are truly exceptional, and I feel very fortunate to have had the opportunity to be taught by him.

To be honest, Python was my first authentic experience of learning programming language and this experience was made memorable by you sir. Older me was saying programming is sooo boring, sooo complicated, an headache. But sir you totally changed my perspective. Now, I have gained confidence

that I too can develop applications.

You just have not only taught us python, You taught insights of python. how python works internally. I never ever trained like this before. You showed the way how to look at concepts insights just not syntax. Its Conceptual + Insights + syntactical Training I got. My words are not enough to express the gratitude but still to get teacher like you needs luck also.

The quizzes at the end of each module were also a great way to test my knowledge. The Q&A; sessions 15-20 mins before and after each lecture added more value to it. The example of "Potter and Stencils" was amazing to understand the difference between "Java and Python's class". Similarly the example of (2 or more) parallel projects while teaching the concept of working with "Virtual Environment" was amazing.

Request the sunbeam management to please start such courses for Ex-CDAC students which helps the CDAC family to grow and show what the CDAC pupils can do with CDAC gurus showing us the way ahead. It would be needless to praise our CDAC guru's knowledge. Teaching methodologies as doing classes from US at 4:30 am PST time I always had a smile on my face a kid like zeal to learn what Sir would bring to the table that day and by end of min 2:30 hrs of a lecture he would leave us in awe. I would say CDAC sunbeam is not an institutional at all, it more of a Gurukul where the pupils are lifelong connected to the Gurus here at Sunbeam like Nilesh Sir, (for motivating when I was about to quit CDAC coming from ECE background), Prashant Sir, Vijay Sir, Sameer Sir (had a magical experience when he taught us in 2011 Feb), Sarang Sir (never thought that Software engineering subject could be fun and also be taught)

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**Recorded videos will be accessible for up to one month from the date of upload.**

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## **Batch schedule**

Sr.No

Batch Code

Start Date

End Date

Time

1

Python-O-15

23-Jan-2026

20-Feb-2026

8:00 AM To

10:30 AM

Schedule : Mon - Fri

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