AI with Python

From Fundamentals to Advanced Applications

Week 1: Python Fundamentals

- **Day 1**: Introduction to Python, installation, and setup
- **Day 2**: Basic syntax, data types, and variables
- **Day 3**: Control structures (if statements, loops)
- **Day 4**: Functions and scope
- **Day 5**: Data structures (lists, tuples, dictionaries)
- **Day 6**: Revision & practice basic problems (10+ problems)

Week 2: Advanced Python & Problem Solving

- **Day 1**: Object-Oriented Programming (OOP) in Python
- **Day 2**: File handling and exceptions
- **Day 3**: Problem-solving
- **Day 4**: Problem-solving & Basic Python project
- **Day 5**: Introduction to NumPy (arrays, operations)
- **Day 6**: Pandas for data handling (basic functions)

Week 3: Data Science Basics

- **Day 1**: Introduction to data analysis with Pandas
- **Day 2**: Data manipulation with Pandas
- **Day 3**: Importing/exporting datasets, CSV, Excel files
- **Day 4**: Data cleaning techniques (handling missing values)
- **Day 5**: Data visualization with Matplotlib (basic charts)
- **Day 6**: Project: Data analysis & visualization

Week 4: Introduction to Machine Learning

- **Day 1**: Overview of machine learning concepts (types, applications)
- **Day 2**: Supervised vs. unsupervised learning
- **Day 3**: Regression techniques and applications (Linear Regression)
- **Day 4**: Classification techniques (Logistic Regression)
- **Day 5**: Clustering techniques (K-means)
- **Day 6**: Project: Predict house prices using Linear Regression

Week 5: Advanced Machine Learning

- **Day 1**: Decision trees and random forests
- **Day 2**: Support vector machines (SVM)
- **Day 3**: Neural network introduction (basic structure)
- **Day 4**: Feature engineering (data scaling, encoding)
- **Day 5**: Handling imbalanced datasets (over/under-sampling)
- **Day 6**: Project: Classification with Logistic Regression

Week 6: Deep Learning Fundamentals

- **Day 1**: Introduction to deep learning (neural networks, applications)
- **Day 2**: Overview of TensorFlow/Keras (setup, basic syntax)
- **Day 3**: Building simple neural networks (basic classification model)
- **Day 4**: Training and evaluating neural networks (overfitting, underfitting)
- **Day 5**: Introduction to CNNs (convolutional layers, pooling)
- **Day 6**: Project: Handwritten digit recognition with CNNs

Week 7: Advanced Deep Learning Techniques

- **Day 1**: Advanced CNN architectures (VGGNet, ResNet)
- **Day 2**: Recurrent Neural Networks (RNNs) & LSTMs (sequential data processing)
- **Day 3**: Generative models (autoencoders, GANs)
- **Day 4**: Optimization and regularization techniques
- **Day 5**: Practical considerations for model deployment
- **Day 6**: Project: Image classification using transfer learning

Week 8: Natural Language Processing (NLP)

- **Day 1**: Introduction to NLP and applications (speech recognition, text generation)
- **Day 2**: Text preprocessing (tokenization, stop words, stemming)
- **Day 3**: Word embeddings (Word2Vec, GloVe)
- **Day 4**: Sentiment analysis using NLP
- **Day 5**: Building a basic NLP model
- **Day 6**: Project: Sentiment analysis on tweets

Week 9: Reinforcement Learning (RL) Basics

- **Day 1**: Introduction to RL (agent, environment, rewards, actions)
- **Day 2**: Markov Decision Processes (MDPs)
- **Day 3**: Q-Learning basics (temporal difference learning)
- **Day 4**: Policy gradients (REINFORCE algorithm)
- **Day 5**: Implementing a simple RL algorithm
- **Day 6**: Project: Basic reinforcement learning simulation

Week 10: Advanced AI Concepts and Techniques

- **Day 1**: Introduction to AI concepts and applications
- **Day 2**: Transfer learning and fine-tuning models (Part 1)
- **Day 3**: Transfer learning and fine-tuning models (Part 2)
- **Day 4**: Generative Adversarial Networks (GANs) (Part 1)
- **Day 5**: Generative Adversarial Networks (GANs) (Part 2)
- **Day 6**: Project: Transfer learning with pre-trained models

Week 11: AI Evaluation & Interpretability

- **Day 1**: Model evaluation techniques (precision, recall, F1 score)
- **Day 2**: Cross-validation and hyperparameter tuning
- **Day 3**: Interpretability in AI models (SHAP, LIME)
- **Day 4**: Interpretability implementation (real-world use cases)
- **Day 5**: Ethical considerations in AI (bias, fairness, data privacy)
- **Day 6**: Project: Image generation using GANs

Week 12: Final Project

- **Day 1-6**: Final project development and submission