Programming for AI (2+1)

Spring 2025 Semester

1. Course Description:

This course introduces students to fundamental programming concepts and their application in Artificial Intelligence. Students will gain proficiency in AI programming language Python focusing on core constructs like variables, data structures, control flow, and object-oriented programming. The course will then delve into practical data analysis and visualization using Python libraries such as NumPy, Matplotlib, and Pandas. Through hands-on exercises and projects, students will develop the ability to write clean, efficient, and effective code for AI-related tasks.

2. CLOS:

CLO-1 Understand the fundamental constructs of Python programming language.

C2 (Understand)

CLO-2 Comprehend the fundamental constructs of programming languages for data analysis and representation.

C2 (Understand)

CLO-3 Understand and apply the Object-oriented concepts in the programming language.

C2 (Understand)

CLO-4 Apply various libraries for plotting, interpreting and analyzing data in Python.

C3 (Apply)

2. Course Outline:

Week	Lecture 1	Lecture 2
1	Introduction to Python and its Environment Variables, Data Types, Operators Basic Input/Output	Control Flow: Conditional Statements (if/else), Loops (for, while)
2	Functions: Defining, Calling, and Arguments Scope and Lifetime of Variables	Working with Strings: Manipulation, Formatting, Methods
3	Lists: Creation, Indexing, Slicing, Methods Tuples: Immutability, Unpacking	Dictionaries: Key-Value Pairs, Accessing, Modifying
4	Object-Oriented Programming (OOP) Concepts Classes, Objects, Attributes, Methods	Inheritance, Polymorphism, Encapsulation

5	Working with Files: Reading, Writing, Appending	Exception Handling: Try-Except Blocks
6	Introduction to NumPy: Arrays, Array Operations, Indexing	NumPy Functions: Mathematical, Statistical, Linear Algebra
7	Introduction to Pandas: Series, DataFrames, Creating DataFrames	Data Manipulation: Indexing, Selection, Filtering
8	Data Cleaning and Transformation: Handling Missing Values, Data Types	Data Aggregation and Grouping: GroupBy, Aggregation Functions
9	Introduction to Matplotlib: Basic Plotting, Line Plots, Scatter Plots	Histograms, Bar Charts, Subplots, Customizations
10	Data Visualization with Pandas: Plotting with Pandas, Advanced Plotting	Working with Time Series Data: Indexing, Resampling, Plotting
11	Introduction to Machine Learning with Python (Optional) Supervised Learning: Regression, Classification	Unsupervised Learning: Clustering, Dimensionality Reduction
12	Introduction to Deep Learning with Python (Optional) Neural Networks: Perceptrons, Multi-layer Perceptrons	Convolutional Neural Networks (CNNs) for Image Recognition
13	Natural Language Processing (NLP) with Python (Optional) Text Preprocessing, Tokenization, Sentiment Analysis	Working with APIs: Making HTTP Requests, JSON Data
14	Introduction to Web Scraping with Python Beautiful Soup, Selenium, Ethical Considerations	Working with Databases: SQL, Connecting to Databases
15	Project Work: AI-Related Project using Python	Project Work: Data Analysis, Machine Learning, or Web Application
16	Project Presentations and Discussions	Review and Q&A, Future of AI and Python

Recommended Textbooks:

1. Miller, B.N., Ranum, D.L. and Anderson, J., 2019. “Python programming in context.” Jones & Bartlett Pub.
2. Joshi, P., 2017. “Artificial intelligence with python.” Packt Publishing Ltd.
3. Severance, C.R., 2016. “Python for everybody: Exploring data using Python 3.” CreateSpace Independent Publ Platform.

CLO and GA Mapping:

CLO-1 Understand the fundamental constructs of Python programming language.	GA1, GA5
CLO-2 Comprehend the fundamental constructs of programming language for data analysis and representation.	GA1, GA3, GA5
CLO-3 Understand and apply the Object-oriented concepts in the programming language.	GA1, GA2, GA3, GA5
CLO-4 Apply various libraries for plotting, interpreting, predicting and analyzing data in Python.	GA5, GA3