Course Syllabus
Gyanmanjari Institute of Technology
Semester-5(B. Tech)

Subject: Python Programming – BETME15320

Type of course: Multidisciplinary Open Professional Elective Courses

Prerequisite: Basic computer operations, Basic mathematics, Basic English

Rationale: The course is designed to introduce concepts from scratch, ensuring a smooth learning curve. Emphasis on hands-on practice, real-life examples, and step-by-step coding exercises will help them grasp programming logic effectively. Additionally, the course provides exposure to practical applications such as data analysis and automation, making it relevant for various engineering and non-technical domains.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
-	-	4	2	-	-	10	40	50	100

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Unit No	Course content
I	**Introduction to Computer Programming:** Concept of Computer Programming, Introduction to Python Programming, Data types in Python, Indexing and Slicing, Operators in Data types, In-built functions and methods **Python Control Flow & Functions:** Statements, Indentations and conditionals, Loops & Iterations, Custom functions in Python, Exception handling, File handling

2	**Object Oriented Programming:** Basic concept of OOPs, creating simple class & objects, Class & Instance attributes, Encapsulation (Hiding data), Inheritance, Polymorphism **Important Python Libraries:** Basic understanding to use the NumPy, Pandas, Matplotlib and Seaborn Libraries
3	**Data Collection and Pre-processing:** Handling missing values, Data Standardization, Label encoding (Binarization), Train-Test split **Introduction to Machine Learning:** Basic understanding of AI, ML and DL, Concept of Supervised, Unsupervised and Reinforcement Learning, Basic ML models (Decision Tree Classifier, Logistic Regression Linear Regression) and Model Evaluation (Model Accuracy, Precision, R2 score and MSE, Residual Plots)
4	**Project work & Case Study:** Basic projects involving the python programming for Data tracking, Recommendation system, Value Prediction, etc. for real life applications

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Exploring Python Inputs for Inventory Management.** Students will create a basic inventory management system using Python's built-in data structures (lists, tuples, and dictionaries, etc.). Students will understand how to efficiently use Python lists, tuples, and dictionaries for storing and managing structured data. They will store product details (name, quantity, price, etc.) in a dictionary, allowing users to add new products, update stock levels, check product details using tuple-based storage, display inventory summary using lists. Students will submit their Python script as screenshot/pdf along with a sample execution output on GMIU web portal.	10
2	**Finance Management – Budget Calculator.** Students will develop a basic budget calculator for managing personal finance using conditionals and loops. The program will effectively interact with user and provide financial planning based on their input (income, expenses, fixed costs, etc.) and manage personal finance according to standard saving schemes and finance management principles. Student will submit their script in pdf format and Input-Output screenshot on GMIU web portal.	10
3	**Create Digital ID.** Students will define a Python class as structured system with attributes like name, id, department, etc. They will create objects of this class and display the details. This introduces them to classes and objects. Students will submit their Python script and output screenshot on GMIU web portal.	10

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4	**Analyze Class Test Scores.** Students will be provided with a CSV file containing class test scores in different subjects. They will Read the CSV file using Pandas, Calculate the average score of each student, Find the highest-scoring and lowest-scoring students, Sort the students based on their total marks, this introduces them to data analysis with Pandas. Students will submit their Python script along with the final sorted Data Frame on GMIU web portal.	10
5	**Recommendation for Selection.** Students will make a simple recommendation system that suggests a tourism place/hotel/movie/song based on user input (e.g., favorite genre). This introduces them to data-driven decision-making. They will present their findings in a short presentation and submit it on a GMIU web portal.	10
	Total	50

Suggested Specification table with Marks (Theory): NA

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	**Remembrance (R)**	**Understanding (U)**	**Application (A)**	**Analyze (N)**	**Evaluate (E)**	**Create (C)**
Weightage	-	-	-	-	-	-

Course Outcome:

After learning the course, the students should be able to:	
CO1	Understand the fundamentals of Python programming, including data types, control flow, and functions, to develop problem-solving skills.
CO2	Apply Object-Oriented Programming (OOP) concepts and utilize important Python libraries like NumPy, Pandas, and Matplotlib for efficient programming.
CO3	Demonstrate data collection, preprocessing techniques, and basic Machine Learning models to analyze and interpret real-world datasets.
CO4	Develop real-life applications and mini-projects using Python, integrating data handling and machine learning concepts for problem-solving.

List of Practical:

Sr. No	Descriptions	Unit No	Hrs.
1	Implement basic Python operations, including variables, data types, and mathematical computations, to develop a strong foundation in programming.	1	4
2	Explore string operations, slicing, list indexing, and built-in functions to process and manage textual and numerical data effectively.	1	6
3	Develop a Python-based interactive number guessing game to understand conditionals, loops, and user input handling.	1	4
4	Design a student record system using Python functions and file handling to efficiently store, retrieve, and update student details.	1	4
5	Create Python classes and objects to understand encapsulation, attributes, and methods in object-oriented programming.	2	6
6	Develop a simple library management system using object-oriented concepts like inheritance and method overriding to manage book records.	2	4
7	Perform matrix manipulations, including addition, multiplication, and transposition, using the NumPy library for efficient numerical computing.	2	4
8	Utilize Matplotlib to create bar charts, line graphs, and scatter plots to visualize and interpret data effectively.	2	4
9	Learn how to identify, handle, and replace missing values in datasets using Pandas for better data preprocessing in machine learning.	3	6
10	Implement train-test split methods to divide datasets for model training and evaluation, ensuring unbiased performance assessment.	3	6
11	Develop a simple classification model using Python	3	6
12	Build a basic machine learning model using Linear Regression to predict product prices based on historical data.	4	6
		Total	60

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory
The internal evaluation will be done on the basis of Active Learning Assignment
Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

[1] "Python Programming: An Introduction to Computer Science" by John Zelle

[2] "Automate the Boring Stuff with Python" by Al Sweigart

[3] "Python Crash Course" by Eric Matthes

[4] "Learning Python" by Mark Lutz

[5] "Fluent Python" by Luciano Ramalho

[6] "Data Science from Scratch" by Joel Grus

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