PYTHON PROGRAMMING AND SOFTWARE DEVELOPMENT COURSE

Introduction

This programme introduces participants to Python programming and develops their ability to design, write, test and maintain software applications. It covers programming fundamentals, data structures, functions, object-oriented programming, file handling, error management, database connectivity, APIs and software testing. Participants learn to develop readable, reusable and maintainable Python code for business applications, data processing, automation and general software development. The programme also introduces development environments, package management, debugging, version control and software documentation. Practical exercises progress from simple scripts to structured applications that solve realistic problems. Depending on participants' interests, projects can include file processing, automated reporting, database applications, API integrations and administrative workflow automation.

Course Objectives

- Explain programming concepts and the structure of Python applications.
- Write Python programs using variables, control structures and functions.
- Manipulate lists, dictionaries, sets, tuples and other data structures.
- Apply object-oriented programming principles.
- Work with files, databases and external APIs.
- Test, debug and document Python applications.
- Develop a functional Python project using appropriate software development practices.

Course Modules

> Module 1: Introduction to Python and Programming Fundamentals

- Programming concepts and applications of Python.

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- Installing Python, selecting an IDE and configuring the development environment.
- Variables, data types, operators and expressions.
- Input, output, comments and basic program structure

> Module 2: Control Structures and Program Logic
- Conditional statements and decision-making.
- For loops, while loops and iteration.
- Loop control, nested structures and logical conditions.
- Writing algorithms and solving programming problems.

> Module 3: Python Data Structures and Collections
- Strings, indexing, slicing and string operations.
- Lists, tuples and common collection operations.
- Dictionaries, sets and key-value data management.
- Iteration, comprehensions and collection transformations

> Module 4: Functions and Modular Programming
- Defining functions, parameters and return values.
- Positional, keyword and default arguments.
- Scope, reusable functions and modular code organization.
- Importing modules, packages and using the Python standard library.

> Module 5: Object-Oriented Programming
- Classes, objects, attributes and methods.
- Constructors and object initialization.
- Encapsulation, inheritance and polymorphism.
- Designing reusable classes and organizing larger applications.

> Module 6: Files, Data Processing and Exception Handling
- Reading and writing text files.
- Processing CSV, JSON and structured data files.
- Exception handling and defensive programming.
- Logging, file management and robust error reporting.

> Module 7: Databases and API Integration
- Relational database concepts and SQL fundamentals.
- Connecting Python applications to databases.
- Sending HTTP requests and consuming REST APIs.

- Processing JSON responses, handling errors and managing credentials.

> Module 8: Software Development Tools and Best Practices
- Virtual environments, dependencies and package management.
- Code style, naming conventions and documentation.
- Git fundamentals, version control and collaboration.
- Debugging techniques and application troubleshooting.

> Module 9: Testing, Security and Application Quality
- Unit testing and automated test fundamentals.
- Test cases, assertions and handling edge cases.
- Input validation, secure coding and protection of credentials.
- Refactoring, code review and maintainability.

> Module 10: Python Software Development Project
- Identifying requirements and designing a program solution.
- Developing modular application logic and data structures.
- Integrating files, databases or external APIs where appropriate.
- Testing, documenting and presenting a working Python application.

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