KOENIG SOLUTIONS · COURSE OUTLINE

Python Programming: OOP, NumPy & Pandas (Koenig Original)

Learn to program in Python, from core syntax and control flow to object-oriented design, file and data formats, NumPy and Pandas.

9 Days	20	158
DURATION	MODULES	TOPICS

COURSE OVERVIEW

This course begins with Python fundamentals, covering syntax, variables, numeral systems, operators, and console input/output. It then moves through control flow, data collections such as lists, tuples, and dictionaries, exception handling, functions, and modules. Later modules address dates and times, mathematical operations, file processing, object-oriented programming, and working with CSV, JSON, and XML data. The course concludes with the NumPy and Pandas libraries for array manipulation and data analysis.

WHO THIS COURSE IS FOR

- **Python Developers**
- **Software Engineers**
- **Data Analysts**
- **Application Developers**
- **Beginner Programmers**

LEARNING OBJECTIVES

- Explain Python's interpreter, syntax, and program structure
- Apply operators and data types to solve programming problems
- Implement control flow using conditional statements and loops
- Build and manipulate lists, tuples, and dictionaries
- Handle exceptions using try-except blocks and exception hierarchies
- Develop custom functions, decorators, and reusable modules
- Implement object-oriented designs with classes and encapsulation
- Process CSV, JSON, and XML data, and analyse it with NumPy and Pandas

COURSE SYLLABUS

20 Modules, 158 Topics

DAY 1

01

Computer Programming and Python Fundamentals

TOPICS

- Understand fundamental terms and definitions
- Interpreting and the interpreter, compilation and the compiler
- Lexis, syntax, and semantics

02

Understand Python's Logic and Structure

TOPICS

Keywords · Instructions · Indentation · Comments

03

Introduce Literals and Variables into Code and Use Different Numeral Systems

TOPICS

- Boolean, integers, floating-point numbers
- Scientific notation
- Strings
- Binary, octal, decimal, and hexadecimal numeral systems
- Variables
- Naming conventions
- Implementing PEP-8 recommendations

04

Choose Operators and Data Types Adequate to the Problem

TOPICS

- **Numeric operators:** ** * / % // + –
- **String operators:** * +
- Assignment and shortcut operators
- Unary and binary operators
- Priorities and binding
- **Bitwise operators:** ~ & ^ | << >>
- **Boolean operators:** not, and, or
- Boolean expressions
- Relational operators (== != > >= < <=)
- The accuracy of floating-point numbers
- Type casting

05

Perform Input/Output Console Operations

TOPICS

The print() and input() functions · The sep= and end= keyword parameters · The int() and float() functions

DAY 2

06

Control Flow – Conditional Blocks and Loops

TOPICS

- **Conditional statements:** if, if-else, if-elif, if-elif-else
- Multiple conditional statements
- Nesting conditional statements
- Building loops with while, for, range(), and in
- Iterating through sequences
- Expanding loops with while-else and for-else
- Nesting loops and conditional statements
- Controlling loop execution with break and continue

07

Data Collections – Tuples, Dictionaries, Lists, and Strings

TOPICS

- Constructing vectors
- Indexing and slicing
- The len() function
- **List methods:** append(), insert(), index(), etc.
- **Functions:** len(), sorted()
- The del instruction
- Iterating through lists with the for loop
- Initializing loops
- The in and not in operators
- List comprehensions
- Copying and cloning
- **Lists in lists:** matrices and cubes

08

Collect and Process Data Using Tuples

TOPICS

- **Tuples:** indexing, slicing, building, immutability
- **Tuples vs. lists:** similarities and differences
- Lists inside tuples and tuples inside lists

09

Collect and Process Data Using Dictionaries

TOPICS

- **Dictionaries:** building, indexing, adding and removing keys
- Iterating through dictionaries and their keys and values
- Checking the existence of keys
- **Methods:** keys(), items(), and values()

DAY 3

10

Python Built-In Exceptions Hierarchy

TOPICS

- BaseException
- Exception
- SystemExit
- KeyboardInterrupt
- Abstract exceptions
- ArithmeticError
- LookupError
- IndexError
- KeyError
- TypeError
- ValueError

11

Basics of Python Exception Handling

TOPICS

- try-except / the try-except Exception
- Ordering the except branches
- Propagating exceptions through function boundaries
- Delegating responsibility for handling exception

DAY 4

12

Functions

TOPICS

- Define and use custom functions within a Python program
- Types of function
- Types of Arguments
- Map Function
- Filter Function
- Reduce Function
- Naming conventions
- Using Imports
- Documentation
- Executing Modules as Scripts
- Extended Keyword Arguments (*args, **kwargs)
- Lambda Functions
- Decorators

13

Modules

TOPICS

What are modules · General Format · Importing Modules · Executing functions from other modules · The __name__ variable

DAY 5

14

Python Dates and Times

TOPICS

Understanding Time · The Time Module · The datetime Module

15

Math

TOPICS

Arithmetic Operators · Assignment Operators · Built-in Math Functions · The math Module · The random Module

08

File Processing

TOPICS

Opening Files · The os and os.path modules · Reading files · Writing into a file · Appending data into a file

DAY 6

16

OOPS in Python

TOPICS

- Introduction to Object-Oriented Python
- Creating Classes, Methods, and Objects
- Using Constructor and Attributes
- Using Class Attributes and Static Methods
- Understanding Object Encapsulation
- Private Attributes and Methods
- Controlling Attribute Access
- Creating and Accessing Properties

DAY 7

17

Playing with Data

TOPICS

- Relational Databases
- CSV
- Getting Data from the Web
- JSON
- Overview of Data Serialization
- Importance of Data Interchange Formats
- Understanding JSON syntax and structure
- Encoding Python Data to JSON - Serialization
- Decoding JSON to Python Data – Deserialization
- Introduction to XML
- Parsing XML with xml.etree.ElementTree
- Best Practices in XML Processing
- Introduction to CSV Format
- Reading CSV data
- Writing Data into CSV files
- Best Practices for CSV Processing
- Integrating JSON, XML and CSV using advanced python library Pandas

DAY 8

18

NumPy

TOPICS

- Introduction to NumPy
- Installation
- NumPy Arrays (numpy.array)
- Array Indexing and Slicing
- Array Shape and Reshaping
- Array Operations (Sum, Mean, etc.)
- numpy.arange and numpy.linspace
- Array Stacking and Splitting
- Data Type Promotion
- Formation of 1D, 2D and 3D arrays
- Exploring dimension type, shape and size of array
- Exploring dimension type, shape and size of array
- Indexing of NumPy Arrays
- Slicing of NumPy Arrays

NumPy (continued)

TOPICS (CONTINUED)

- One's Matrix and Zero's Matrix
- Identity Matrix
- min() and argmin()
- max() and argmax()
- np.sort()
- np.argsort()
- Addition of matrices
- Multiplication of matrices

DAY 9

19

Pandas

TOPICS

- Introduction to Pandas
- Series
- DataFrames
- Missing Data
- Merging Joining and Concatenating
- Operations
- Data Input and Output
- Groupby()
- Pivoting
- VLookup

WHAT IS INCLUDED

Everything You Need to Succeed

- Koenig course material for every module
- Delivery by certified instructors and subject matter experts
- Hands-on exercises throughout the course
- Course completion certificate from Koenig

ABOUT KOENIG

Who We Are

Established in 1993, Koenig Solutions is a globally recognised training provider with 35+ technology partnerships, 5,000+ training programmes and a network of certified instructors and subject matter experts, supporting individuals and enterprise teams worldwide.

FLEXIBLE DELIVERY

Learn the Way That Suits You

Classroom Training | Live Online Classes (ILO) | Fly-Me-A-Trainer (FMAT) | Flexi (Self-Paced) | 1-on-1 Training

Ready to Get Started?

Talk to a learning advisor about schedules, group training and customised delivery.

Visit koenig-solutions.com | info@koenig-solutions.com