

KOENIG SOLUTIONS · COURSE OUTLINE

Python Programming for Clinical Medical Domain

Learn to use Python and Pandas to validate, automate and report on clinical trial data, from refresher basics to dashboards.

5 Days

DURATION

53

TOPICS

4

HANDS-ON LABS

COURSE OVERVIEW

This course begins with a Python and Pandas refresher, covering data types, control flow, file handling and clinical trial dataset structures such as CDISC SDTM. It then moves into advanced Python concepts including object-oriented programming, reusable modules, error handling and logging for building automation tools. Subsequent modules cover advanced Pandas operations, data validation against CRF specifications, discrepancy reporting and Excel styling, followed by automating multi-file processing, scheduling tasks, generating reports with charts, and building Streamlit dashboards. The course concludes with a hands-on workshop to design and build a clinical data automation tool, including API integration, PHI anonymisation and documentation practices.

WHO THIS COURSE IS FOR

Clinical Data Analysts

Clinical Programmers

Data Validation Specialists

Clinical Trial Reporting Staff

Automation Developers

PREREQUISITES

- Knowledge of programming

LEARNING OBJECTIVES

- Apply Python data types, control flow and functions to clinical data tasks
- Use Pandas to load, filter, sort and summarise trial datasets
- Implement object-oriented programming for building automation tools
- Apply error handling and logging for audit trails
- Validate datasets against CRF specifications and detect discrepancies
- Build discrepancy and summary reports using openpyxl and xlswriter
- Automate multi-file processing and scheduled data tasks
- Develop Streamlit dashboards for visualising clinical metrics

53 Topics

DAY 1**Python Refresher****Python Refresher**

Lab

TOPICS

- Data types (str, int, float, list, dict, tuple, set)
- Control flow (if, for, while, break/continue)
- Functions (default args, keyword args, return values)
- Modules & imports (math, os, sys)

File Handling**TOPICS**

Reading/writing text, CSV, and Excel files · Using pathlib for file paths

Clinical Trial Data Overview**TOPICS**

- Common dataset types (demographics, AE, visits, labs)
- Understanding CDISC SDTM dataset naming conventions

Using Pandas for Basic Operations**TOPICS**

Loading datasets · Viewing structure & summary statistics · Selecting & filtering rows · Sorting data

DAY 2**Advanced Python Concepts for Automation****Advanced Functions**

Lab

TOPICS

Lambda functions, map, filter, reduce ·
List/dict comprehensions

Object-Oriented Programming**TOPICS**

Creating classes & methods · Inheritance & method
overriding · Practical OOP for automation tools

Creating Reusable Modules**TOPICS**

- Writing helper functions for repeated validations
- Structuring project folders

Error Handling & Logging

TOPICS

- try/except/finally
- Logging data validation results for audit trails
- Using Python virtual environments for project isolation

DAY 3

Data Processing & Specification Validation

Advanced Pandas

Lab

TOPICS

GroupBy and multiple aggregations · Pivot tables for trial summaries · Merging datasets (inner, left, right joins)

Data Validation Techniques

TOPICS

- Detecting missing patient visits
- Verifying variable names match CRF specifications
- Data type enforcement

Comparing Datasets

TOPICS

Between CRF specs & actual data · Highlighting discrepancies

Creating discrepancy reports for stakeholders · Using openpyxl to style Excel output

DAY 4

Automation & Reporting

Automating multi-file Processing

Lab

TOPICS

Iterating over site-submitted datasets · Consolidating into a master file

Automating Periodic Tasks

TOPICS

- Scheduling scripts (Windows Task Scheduler / cron jobs)

Creating Summary Reports

TOPICS

Adding charts with `xlswriter` · Exporting to Excel and PDF

Data Visualization for Clinical Metrics

TOPICS

Patient enrollment trends · AE severity breakdowns · Visit compliance heatmaps

Introduction to Streamlit Dashboards

TOPICS

Adding interactivity · Filtering and searching patient records

DAY 5

Hands-On Workshop: Build a Clinical Data Automation Tool

TOPICS

- Identifying automation opportunities in clinical workflows
- Defining problem statements
- Breaking down requirements into Python tasks

Integrating

TOPICS

Data loading · Cleaning & validation · Reporting & visualization

Using APIs for Clinical Reference Data

TOPICS

- Fetching MedDRA codes
- Drug info lookups
- Data anonymization techniques for PHI protection

Final Best Practices

TOPICS

Code documentation · Reusability & maintainability

Practise What You Learn

MODULE	ACTIVITY
Python Refresher	Load Subject Demographics file, clean missing Age/Sex/Country, and produce patient count by country & gender
Advanced Python Concepts for Automation	Create a Clinical Data Validator class that reads lab results, flags abnormal values per reference range, and logs errors
Data Processing & Specification Validation	Compare a Vital Signs specification to collected data, identify missing variables & mismatches, and create a compliance summary
Automation & Reporting	Automate reading monthly site submissions, validate completeness, merge into master dataset, and export multi-tab Excel + PDF reports

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.

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