KOENIG SOLUTIONS · COURSE OUTLINE

Applied GenAI Python: LangChain, RAG & Agentic AI

Learn to build RAG pipelines and agentic AI systems with Python, LangChain, LangGraph and CrewAI.

56 Hours	17	52	7
DURATION	MODULES	TOPICS	HANDS-ON LABS

COURSE OVERVIEW

This course offers a robust foundation in Python programming, machine learning fundamentals, and cutting-edge generative AI systems. In Section I, learners begin by brushing up on Python essentials—from syntax and data structures to control flow, NumPy, Pandas, and data visualization—before progressing into core ML concepts, frameworks like Scikit-learn and TensorFlow, and a mini project focused on classification, regression, and clustering. Section II transitions into the world of Generative AI, covering foundational architectures, large language models (LLMs), prompt engineering, and Retrieval-Augmented Generation (RAG) systems. Participants will explore agentic AI frameworks such as LangChain, LangGraph, and CrewAI, alongside practical labs and demos using tools like Ollama and Azure AI Foundry. The course concludes with advanced fine-tuning techniques and a critical focus on ethical and responsible AI practices, preparing learners to build, evaluate, and deploy intelligent systems with confidence and accountability.

WHO THIS COURSE IS FOR

- **Python Developers**
- **Machine Learning Engineers**
- **Data Scientists**
- **AI Engineers**
- **GenAI Solution Architects**

PREREQUISITES

- Python, Machine learning and Deep learning (conceptual)

LEARNING OBJECTIVES

- Apply Python, NumPy and Pandas for data handling
- Build machine learning models with Scikit-learn and TensorFlow
- Explain large language model architectures and major LLM families
- Apply prompt engineering techniques for text, image and code
- Implement Retrieval-Augmented Generation systems with LangChain and Ollama
- Develop agentic AI systems using LangGraph, CrewAI and Autogen
- Configure fine-tuning and quantization for models such as Gemma
- Assess ethical, cost and LLMOps considerations in generative AI

COURSE SYLLABUS

17 Modules, 52 Topics

Section I: Brushing upon Python and ML Fundamentals

01

Introduction to Python for ML

TOPICS

Why Python? · Environment setup (Jupyter/Colab) · Basic syntax, variables, operations

02

Python Data Structures

TOPICS

Lists, Tuples, Dictionaries · Indexing, slicing, iteration

03

Control Flow & Functions

TOPICS

If-else, loops · Defining functions

04

NumPy & Pandas

TOPICS

Arrays, slicing · Multi-dimensional operations · DataFrames, Series · Missing values, grouping, merging

05

Data Visualization

TOPICS

Matplotlib & Seaborn · Line, bar, histogram plots

06

ML Concepts

TOPICS

- Supervised, Unsupervised, Reinforcement
- Scikit-learn basics
- Deep Learning Neural Network Understanding
- Intro to TensorFlow, Transformers, GANs, Diffusers

07

Pydantic Framework

TOPICS

- Core Concepts like Base Model, Type Hinding, annotation, default values etc. (topics aligned with langgraph state creations)

08

Mini Project (Homework)

TOPICS

Classification, regression, clustering

Section II: Generative AI

09

Introduction to GenAI

TOPICS

Architecture & applications · GANs

10

Lab

Large Language Models (LLMs)

TOPICS

- Architecture & types
- **Major LLMs:** Llama, Qwen, Cohere, Falcon
- **Text AI tasks:** translation, summarization, speech
- **Image AI tasks:** detection, segmentation, captioning, VQA

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Lab

Prompt Engineering

TOPICS

- Techniques for text, image, code
- Context Engineering
- Standard templates
- Using Meta's Llama
- Generative AI tools helpful for Upgradation and learning

12

2 Labs

Basic LLM Systems (RAG)

TOPICS

- RAG concepts
- **LangChain:** Intro, prompt templates, chains, agents
- Ollama for running the model locally

13

Lab

Advanced RAG and QnA Systems

TOPICS

RAG vs QnA · Tabular & SQL QnA systems · **Advanced RAG:** Agentic RAG, Multimodal RAG

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Agentic AI Systems (Lab Based Topics)

TOPICS

- **Agent Frameworks:** LangChain, LangGraph, Autogen, CrewAI, Agno
- Multi-agent Systems
- MCP - Introduction and Use cases
- No code/low code agent creation

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Azure AI Foundry (Only Demo)

TOPICS

- Retrieval-Augmented Generation (RAG) Implementation
- Fine-tuning Models on Azure
- Implementing Content Filters
- Model Evaluation and Monitoring
- Agents
- Demo

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Lab

Fine-Tuning Techniques

TOPICS

Quantization & optimization · Fine-tuning Gemma

17

Lab

Ethical & Responsible Generative AI

TOPICS

- Ethical & Responsible Generative AI principles
- Open-source ethical frameworks
- **Cost Estimation:** API pricing, Model pricing
- LLMOps: Discussion

HANDS-ON LABS

Practise What You Learn

#	MODULE	ACTIVITY
10	**Large Language Models (LLMs)**	Labs
11	**Prompt Engineering**	Labs
12	**Basic LLM Systems (RAG)**	■ chatbot ■ RAG Implementation
13	**Advanced RAG and QnA Systems**	Hands-on labs and real-world implementation
16	**Fine-Tuning Techniques**	Labs
17	**Ethical & Responsible Generative AI**	Labs

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.

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