Interactive LLM Project Course with Python Focus

### Phase 0: Environment & Tooling Setup

**Session 0: Python & Environment Setup** – *3 Hours*

* Installing Python on Windows/Mac/Linux
* Setting up Poetry, virtualenv, conda, and pip
* IDE setup: Visual Studio Code with Python extensions
* Introduction to Git/GitHub and basic version control
* Project scaffolding and dependency management

**Objective:** Prepare students to build and run Python projects confidently.

### Phase 1: Python Refresher and LLM App Basics

**Session 1: Python Syntax Refresher** – *4 Hours*

* Variables, data types (lists, dicts, etc.)
* Control flow (if-else, loops)
* Functions, error handling
* Working with libraries and virtual environments

**Session 2: Introduction to LLMs and llamaindex** – *4 Hours*

* Overview of LLMs and the llamaindex library
* Installation and setup of llamaindex
* Basic interaction with LLMs using llamaindex (simple queries)

### Phase 2: LLM Application Backend with llamaindex

**Session 3: Project Structure and API Design** – *3 Hours*

* Backend project structuring (folders, config files)
* Designing APIs to interact with LLMs
* Processing input/output and error handling

**Session 4: Building the LLM Backend** – *4 Hours*

* Implementing APIs using llamaindex
* Integrating LLM responses with backend logic
* Asynchronous handling and performance optimization

### Phase 3: Advanced LLM Features

**Session 5: Fine-Tuning LLMs** – *4 Hours*

* Introduction to fine-tuning techniques
* Dataset preparation and selection
* Fine-tuning and evaluating LLMs with llamaindex

**Session 6: Function Calling in LLMs** – *3 Hours*

* Overview of function calling in LLMs (e.g., OpenAI)
* Implementing function calls with llamaindex
* Use case: calling external APIs from within the LLM

### Phase 4: Frontend Integration

**Session 7: Frontend Integration with LLM Backend** – *4 Hours*

* Connecting backend to frontend using REST APIs or WebSockets
* Displaying LLM output in a frontend framework (React, Angular, etc.)
* Testing end-to-end communication between client and server

### Phase 5: Testing and Benchmarking

**Session 8: Testing LLM Applications** – *3 Hours*

* Unit and integration testing of backend logic
* Mocking LLM responses
* API testing with Postman/Insomnia

**Session 9: LLM Benchmarking** – *3 Hours*

* Measuring performance: response time, accuracy
* Comparing models (pre-trained vs fine-tuned)
* Advanced benchmarking: latency, memory usage, scalability

### Phase 6: Final Project and Review

**Session 10: Final Project Presentation** – *4 Hours*

* Students build and present their end-to-end LLM applications
* Incorporation of fine-tuning, function calling, and benchmarking
* Peer review and collaborative feedback session

### Project Ideas

**1. Customer Support Chatbot for E-Commerce**An AI chatbot that handles customer queries, offers product recommendations, and integrates with platforms like Shopify.

**2. AI-Powered Programming Tutor**A tutor that helps students with real-time code explanations, error fixes, and programming challenges.

**3. Personalized Diet & Nutrition Planner**Smartwatch-based system that adapts meal plans based on daily activity and hydration.

**4. AI Fitness Coach with Smartwatch Integration**Live feedback and recovery suggestions based on heart rate and workout data.

**5. Legal Document Assistant**An LLM that helps users draft and review contracts or legal forms, providing suggestions and summarizing clauses.

**6. Resume and Cover Letter Generator**A smart assistant that generates job-specific resumes and cover letters based on user profiles and job descriptions.

**7. Real-Time Meeting Summary Bot**Join video calls or extract meeting notes from transcripts and generate concise action points and summaries.

**8. Educational Content Generator**Create quizzes, flashcards, or study guides for specific academic topics powered by LLM understanding.

**9. AI Writing Assistant for Blogs and Emails**Assist users in drafting, editing, and enhancing content for blogs, marketing campaigns, or formal emails.