Practical Generative AI for Programmers: From Fundamentals to Real Applications

Week 1 – Foundations of Generative AI (Technical Grounding)

Goal : Ground students in how generative AI actually works so they can use it intelligently and responsibly.

Topics Covered

- What is Generative AI (vs traditional software)
- How Large Language Models (LLMs) work:
  - Tokens, embeddings, transformers (conceptual)
  - Training vs inference
- What models can and cannot do
- Hallucinations, determinism, temperature
- Prompting as a technical skill
- AI as a pair programmer, not a replacement

Hands-On Exercise :

- Interacting with an LLM:
  - Asking for code explanations
  - Asking for refactoring
  - Asking for test cases
  - Compare weak prompts vs strong prompts

Week 2 – AI-Powered Programming Workflow (GitHub, VS Code, Copilot)

Goal : Teach a modern AI-assisted development environment.

Topics Covered

- GitHub fundamentals (repos, commits, branches)
- VS Code essentials for productivity
- GitHub Copilot:
  - Inline suggestions
  - Comment-driven coding
  - Refactoring with Copilot
  - Human-in-the-loop coding
- Reading and validating AI-generated code

Hands-On Lab

- Create a GitHub repository
- Open in VS Code
- Use Copilot to:
- Generate a function from comments
- Refactor existing code
- Add error handling

Week 3 – Generating SQL with AI (Analytics & Data Use Cases)

Goal : Enable students to use AI as a SQL assistant for real-world data tasks.

Topics Covered

- Translating business questions into SQL
- AI-generated SQL:
  - SELECT, JOIN, GROUP BY, window functions
  - Validating correctness and performance
  - Common AI SQL mistakes
- Using AI for query optimization and explanation

Hands-On Lab

- Given a sample schema:
- Generate SQL from natural language
- Debug incorrect queries
- Ask AI to explain complex queries

Week 4 – Vibe Coding a Python Program

Goal : Show how to build functional Python programs primarily through prompts.

Topics Covered

- What “vibe coding” means
- Structuring prompts for:
  - Program design
  - Functions
  - Error handling
- Iterative development with AI
- Debugging AI-generated Python
- Adding logging and tests with AI

Hands-On Lab

- Vibe code a Python program such as:
- File processing tool
- API data fetcher
- Simple analytics script
- Refine through multiple prompt iterations

Week 5 – Vibe Coding a Website (Frontend + Backend Light)

Goal : Teach students to build a simple website using AI assistance.

Topics Covered

- Website architecture (frontend/backend basics)
- Using AI to generate:
    - HTML/CSS
    - JavaScript
    - Simple Python/Flask or Node backend
    - Prompting for UI changes
    - Accessibility and basic UX considerations
- Hands-On Lab
    - Vibe code a website:
    - Landing page
    - Form input
    - Backend processing
    - Iteratively improve layout and behavior via prompts

Week 6 – Hosting & Deployment + Best Practices

Goal : Teach students how to deploy what they built and operate responsibly.

Topics Covered :

- Hosting options (GitHub Pages, Render, Vercel, basic cloud concepts)
- Environment variables and secrets
- Deployment using AI-generated instructions
- Monitoring and basic troubleshooting
- Ethical, legal, and professional considerations
- Future learning paths

Hands-On Lab

- Deploy the website built in Week 5
- Make it publicly accessible
- Test and fix issues using AI assistance