GENERATIVE AI ENGINEER PROFESSIONAL PROGRAM – 2025 EDITION

"Build AI that creates, innovates, and inspires"

Market Demand Note

Generative AI is one of the fastest-growing fields in AI, powering breakthroughs in art, content generation, code writing, product design, and personalized experiences. Companies are seeking engineers who can harness large language models (LLMs) and generative architectures to create cutting-edge applications.

Duration: 12 Weeks | Mode: Online/Offline

📘 Generative AI Engineer Professional Program — 2025 Edition

Key Tools & Technologies:
Python, PyTorch, TensorFlow, Hugging Face Transformers, LangChain, OpenAI API, Stable Diffusion, Midjourney API, DALL·E, Weaviate/Pinecone (Vector DB), FastAPI, Docker, GitHub, Streamlit.

Learning Objectives

By the end of this program, learners will be able to:

1. Understand and fine-tune generative AI models (LLMs, diffusion models, GANs).
2. Work with APIs and SDKs for generative AI integration.
3. Implement multimodal AI applications combining text, image, and audio.
4. Build production-ready generative AI workflows and tools.
5. Apply prompt engineering for better model outputs.

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Detailed Content

Week 1: Introduction to Generative AI

- Global trends: Explosion of foundation models, multimodal applications, agentic AI, and federated learning for privacy.
- Core architectures: LLMs (GPT, Claude), GANs, diffusion models (Stable Diffusion, DALL·E), and their real-world impact across industries.
- Setup: Install Python 3.10+, CUDA, PyTorch 2.x, JupyterLab, Hugging Face Transformers, diffusers.
- Hands-on: Explore demos of text, image, and code generation using open-source models.

Industry relevance: Enterprises now expect AI teams to understand the full GenAI stack—not just research, but deployment and scaling.

Week 2: Foundation Models & APIs

- Commercial & open-source LLMs: GPT-4, Claude, LLaMA, Mistral—compare strengths, costs, and licensing.
- APIs: Sign up for OpenAI, Anthropic, and Hugging Face Hub; learn to make authenticated calls.
- Model registry: Discover, compare, and download models from Hugging Face Hub.
- Hands-on: Generate text, chat, and summaries using APIs. Benchmark local vs. hosted models.

Market trend: Balancing cost, latency, and privacy—cloud APIs vs. local/on-prem deployment.

Week 3: Prompt Engineering

- Best practices: Clear instructions, system/user prompts, structured output.
- Advanced techniques: Zero-shot, few-shot, chain-of-thought, tree-of-thought, constitutional prompting.
- Evaluation: Metrics for prompt quality, bias, and safety.
- Hands-on: Optimize prompts for summarization, question-answering, and creative tasks.

Industry demand: Prompt engineering is a distinct, growing role in tech companies.

Week 4: Fine-tuning LLMs

- Dataset curation: Collect, clean, and format domain-specific data (e.g., legal, medical, customer support).
- Efficient tuning: LoRA, PEFT, QLoRA for parameter-efficient, affordable fine-tuning.
- Evaluation: Metrics beyond accuracy—robustness, bias, safety.
- Hands-on: Fine-tune LLaMA or Mistral for a custom task, deploy locally and via API.

Current tools: Unsloth, Axolotl, PEFT library, Hugging Face Transformers.

Week 5: Image Generation Models

- Architectures: Stable Diffusion, DALL·E, Midjourney (APIs and open-source).
- Custom generation: Dreambooth, textual inversion, ControlNet for style/pose control.
- Fine-tuning: Adapt models for product design, marketing, medical imaging.
- Hands-on: Generate and customize images; fine-tune on a custom dataset.

Portfolio value: Showcasing domain-specific image generation is a differentiator for design, e-commerce, and content roles.

Week 6: Multimodal AI

- Models: CLIP (image-text), BLIP (image captioning), Whisper (speech-text).
- Integration: Build apps that accept text+image+audio, generate cross-modal outputs.
- Hands-on: Create a travel assistant (image → itinerary + audio guide), or a marketing content generator.

Industry trend: Multimodal AI is the next frontier—product teams want engineers who can fuse modalities.

Week 7: GenAI for Code & Automation

- Code generation: Codex, Code LLaMA, StarCoder—benchmark for correctness and security.

- Automation: Build Copilot-like tools for Python, SQL, infrastructure-as-code.
- Hands-on: Generate, explain, and refactor code; integrate into CI/CD pipelines.

Market relevance: AI-assisted coding boosts productivity 2–3x in tech teams.

Week 8: LangChain & Vector Databases

- Pipeline orchestration: LangChain for multi-step, tool-using workflows.
- Semantic search: Pinecone, Weaviate, FAISS—index and retrieve embeddings at scale.
- Hands-on: Build a RAG (Retrieval-Augmented Generation) app for Q&A over custom docs.

Job skill: Building and optimizing RAG pipelines is a top ask in AI product roles.

Week 9: AI Agents & Tool Integration

- Agent design: LLM-powered agents that use APIs, databases, and web tools.
- Orchestration: LangChain Agents, AutoGPT, BabyAGI—plan, execute, and critique multi-step tasks.
- Hands-on: Build an AI agent that books flights, summarizes news, or automates customer support.

Industry trend: Autonomous agents are entering SaaS, fintech, and enterprise automation.

Week 10: Deployment & Scaling

- API servers: FastAPI, Flask—containerize with Docker, deploy on Kubernetes.
- Cloud scaling: AWS SageMaker, GCP Vertex AI, Azure ML—managed endpoints, auto-scaling, spot instances.
- Monitoring: Logging, alerting, cost tracking.
- Hands-on: Deploy a GenAI app to cloud, optimize for latency and cost.

Enterprise standard: MLOps, CI/CD, and cloud-native deployment are baseline expectations.

Week 11: Real-World Project Development

- Project scoping: Choose a capstone idea or industry dataset.
- End-to-end pipeline: Data → model → evaluation → deployment → monitoring.
- Testing: Unit, integration, security, bias/fairness, load testing.
- Hands-on: Deliver a production-grade GenAI solution with full docs.

Portfolio value: Completed, deployed projects are the #1 differentiator in interviews.

Week 12: Capstone Project Presentation

- Demo: Live, interactive presentation of your app.
- Peer review: Code quality, architecture, ethics, scalability.
- Portfolio: GitHub repo, README, demo video, API if applicable.
- Career prep: Resume tips, LinkedIn/portfolio optimization, interview practice.

Industry expectation: Communication, ethics, and deployment experience separate juniors from seniors.

Capstone Project Ideas

- AI-Powered Design Assistant: Generate UI/UX mockups from text descriptions and user feedback.
- Multimodal Marketing Studio: Take product images + prompts, and output social posts, ads, and audio/video clips.
- AI Content Studio: Automate article, social post, and custom graphic generation at scale for media companies.

Current Tools & Industry Trends

- Language/Code: Python, PyTorch, TensorFlow, JAX, Hugging Face Transformers, LangChain, LlamaIndex.
- Image/Audio: Stable Diffusion, DALL·E, Midjourney, Whisper, Librosa, torchaudio.
- Deployment: FastAPI, Docker, Kubernetes, GitHub Actions, MLflow, Weights & Biases.

- Cloud: AWS, GCP, Azure—managed endpoints, serverless, spot/preemptible instances.
- Security: Model robustness, privacy (federated learning), access control.
- Ethics: Bias detection, explainability, copyright/regulation awareness.
- Trends: Multimodal, agentic, and federated AI; MLOps maturity; responsible AI.