

Detailed Skills Breakdown for Vanderbilt University AI Courses

Generative AI Software Engineering Specialization

Course 1: Claude Code: Software Engineering with Generative AI Agents

Technical Skills Acquired:

- **Multi-branch Git workflow orchestration** with AI subagents working across parallel development streams
- **CLAUDE.md file creation** for establishing project context and AI agent instructions
- **Command-line interface mastery** for AI-assisted development workflows
- **"Best of N" pattern implementation** for generating multiple solution approaches
- **Git worktrees management** for concurrent feature development
- **Quality assurance processes** for validating AI-generated code
- **Production deployment workflows** using AI assistance

Practical Applications:

- Orchestrate Claude Code like a tech lead managing multiple senior developers
- Build complete applications in minutes rather than weeks
- Manage parallel AI agents developing different features simultaneously
- Transition from traditional coding to AI orchestration workflows
- Implement robust testing and validation systems for AI-generated code

Course 2: AI Agents and Agentic AI with Python & Generative AI

Core Technical Skills:

- **Complete AI agent framework development** in Python from scratch
- **GAME components mastery** (Goals, Actions, Memory, Environment) architecture
- **Tool discovery systems design** and function calling mechanisms
- **Dynamic typing and metaprogramming** in Python for flexible agent frameworks
- **API integration** for agents to interact with external systems
- **Agent loop implementation** with autonomous decision-making capabilities
- **Multi-agent collaboration systems** with memory sharing and coordination

Advanced Competencies:

- Build production-ready agents for intelligent file exploration and documentation generation
- Implement agents that dynamically adopt different expert personas
- Create trustworthy agent architectures using staged execution and safety patterns
- Design agents for complex workflow automation without human intervention
- Develop debugging skills for understanding agent behavior at every level

Course 3: Prompt Engineering for ChatGPT

Expert-Level Skills:

- **15+ distinct prompt patterns** including persona-based prompting, question refinement, and cognitive verification
- **Chain-of-thought reasoning** implementation and emergent capability unlocking
- **Template-based output formats** and meta-language creation for custom command systems
- **Self-consistency checking methods** and escape valve implementation
- **In-context learning** and retrieval augmented generation (RAG) techniques
- **Multi-domain prompt applications** across business, creative, and technical contexts

Productivity Applications:

- Business automation: PowerPoint generation, Excel analysis, and document processing
- Creative workflows: game design, content creation, and storytelling
- Analytical tasks: PDF information extraction, survey analysis, and data synthesis
- Programming support: code generation, debugging assistance, and architecture planning
- Achieve 10X productivity increases through sophisticated AI interaction patterns

Course 4: OpenAI GPTs: Creating Your Own Custom AI Assistants

Custom AI Development Skills:

- **Custom GPT architecture design** for domain-specific business applications
- **Knowledge base integration** and document upload optimization
- **Conversation flow design** for natural user interactions
- **Business context understanding** and domain-specific language modeling
- **Action integration** for connecting GPTs to external systems and APIs
- **User experience optimization** for custom AI assistant interfaces
- **Testing and validation frameworks** for custom GPT performance

Business Integration Applications:

- Build AI assistants for legal document analysis and compliance checking
- Create supply chain logistics optimization tools
- Develop scientific research and hypothesis generation assistants
- Design customer service automation with context-aware responses
- Implement expense reporting and reimbursement automation systems

Generative AI Data Analyst Specialization

Course 1: Chat with Your Data: Generative AI-Powered SQL Data Analysis

Database Analysis Skills:

- **CLUE framework mastery** for establishing accurate database context
- **Experimental query generation** for building complex SQL queries through AI collaboration
- **TRUST method implementation** for verifying analytical results and ensuring accuracy
- **Visualization-first query design** for creating compelling data presentations
- **CAPTURE pattern usage** for building reproducible analysis pipelines
- **DEBUG framework application** for efficient SQL troubleshooting and optimization

AI-Enhanced Analytical Capabilities:

- Transform complex database questions into accurate SQL queries through natural language
- Create compelling data visualizations and dashboards without traditional coding
- Establish conversational partnerships with databases for exploratory analysis
- Build automated verification systems for data quality and result validation
- Develop context-aware database interaction workflows

Course 2: ChatGPT + Excel: Master Data, Make Decisions, Tell Stories

Advanced Excel Integration:

- **AI-guided spreadsheet analysis** with automated insight generation
- **Dynamic visualization creation** directly from Excel data using ChatGPT
- **Formula optimization** and complex calculation development through AI assistance
- **Pivot table automation** and advanced data manipulation techniques
- **Data storytelling frameworks** for executive-level reporting

- **Interactive dashboard development** without traditional programming

Business Intelligence Applications:

- Transform raw Excel data into executive presentations and strategic insights
- Automate repetitive data processing tasks and report generation
- Create interactive data exploration tools for business stakeholders
- Develop predictive analysis capabilities using AI-enhanced Excel workflows
- Build comprehensive business intelligence systems from spreadsheet data

Course 3: ChatGPT Advanced Data Analysis

Multi-Format Data Processing:

- **PDF extraction and analysis** with automated content summarization
- **Image and video processing** including automated resizing and cataloging
- **Document transformation workflows** from raw files to presentations and training materials
- **Cross-format data integration** combining Excel, PDF, PowerPoint, and multimedia files
- **Automated compliance checking** against policy documents and regulatory requirements
- **Social media content generation** from document transcripts and data sources

Workflow Automation Skills:

- Build end-to-end data processing pipelines from file upload to final deliverables
- Create automated reporting systems that generate PowerPoint presentations from Excel data
- Develop document analysis workflows for large-scale content processing
- Implement quality assurance processes for AI-generated analyses and reports
- Design scalable data processing systems for enterprise-level applications

Course 4: Prompt Engineering for ChatGPT (Shared with Software Engineering)

See detailed breakdown above

Generative AI Leadership & Strategy Specialization

Course 1: Generative AI for Leaders

Executive-Level AI Integration:

- **Strategic AI partnership development** for confidential decision-making support

- **Agenda architecting** with AI assistance for perfectly planned meetings and strategic sessions
- **Proposal proficiency enhancement** using AI for risk identification and ambiguity analysis
- **Private think-tank utilization** for brainstorming and strategy refinement
- **Masterful communication** through AI-assisted document drafting and email composition
- **HR dynamics navigation** with AI insights for delicate conversation management

Organizational Leadership Skills:

- Lead AI transformation initiatives while addressing staff anxiety and resistance
- Implement AI-augmented productivity systems achieving 50-80% efficiency gains
- Develop change management strategies for AI integration across organizations
- Create ethical AI governance frameworks and responsible AI usage policies
- Design human-AI collaboration workflows that maintain decision quality while increasing speed
- Build competitive advantage through strategic AI implementation

Course 2: Prompt Engineering for ChatGPT (Shared)

See detailed breakdown above

Course 3: Trustworthy Generative AI

AI Reliability and Safety Skills:

- **Problem suitability assessment** for determining appropriate AI applications
- **Risk framework development** for AI implementation in sensitive business contexts
- **Prompt engineering for trust** using techniques that generate reliable, verifiable outputs
- **Output verification methods** and validation frameworks for AI-generated content
- **Creative ideation processes** that leverage AI hallucination as a feature, not a bug
- **Human-AI collaboration optimization** for augmenting rather than replacing human reasoning

Ethical AI Implementation:

- Build trust frameworks for AI system deployment in critical business processes
- Develop quality assurance processes that ensure AI output reliability
- Create safety nets and human oversight mechanisms for AI-driven workflows
- Implement bias detection and mitigation strategies in AI applications
- Design transparent AI systems with explainable decision-making processes
- Establish ethical guidelines for AI usage across different organizational contexts

Cross-Cutting Skills Across All Programs

Universal Technical Competencies:

- **Advanced prompt engineering** across multiple AI platforms and use cases
- **AI workflow orchestration** for complex, multi-step business processes
- **Quality assurance frameworks** for validating AI outputs across different domains
- **Human-AI collaboration design** that amplifies human capabilities rather than replacing them
- **Integration capabilities** for connecting AI tools with existing business systems

Professional Transformation Skills:

- **AI-augmented productivity** achieving 50-1000% productivity improvements
- **Strategic thinking enhancement** through AI-assisted analysis and planning
- **Problem-solving acceleration** using AI as a collaborative partner
- **Innovation capabilities** for developing new AI-enhanced business processes
- **Future-proofing expertise** that remains relevant as AI technology evolves

Business Value Creation:

- **Competitive advantage development** through strategic AI implementation
- **Process automation design** for eliminating repetitive tasks while maintaining quality
- **Decision-making enhancement** through AI-assisted analysis and insight generation
- **Communication effectiveness** through AI-enhanced document creation and presentation
- **Scalable solution architecture** for enterprise-level AI deployment

All courses emphasize hands-on, practical application with real-world projects that simulate authentic industry scenarios. Students build comprehensive portfolios demonstrating AI-enhanced capabilities that immediately translate to professional advantage in rapidly evolving, AI-augmented workplace environments.