Generative AI Applications in Business

Course Syllabus - Undergraduate Level

Course Code: ISM-XXXX
Credits: 3
Semester: Fall 2025
Prerequisites: None

Contact Information

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COURSE DESCRIPTION

This comprehensive course explores the fundamentals, applications, and implications of Generative Artificial Intelligence (Gen AI) in business contexts. We explore the transformative role of Gen AI in modern business environments and ecosystems. Students will gain both theoretical knowledge and practical experience in implementing Gen AI solutions across various business functions. The course combines lectures with hands-on assignments and case analyses, culminating in a final project that demonstrates the practical application of Gen AI in solving real-world business challenges.

COURSE PURPOSE & KEY TAKEAWAYS

This course equips students with:

- Deep understanding of Generative AI technologies and their business applications
- Practical skills in prompt engineering and Gen AI implementation
- Critical thinking abilities for evaluating Gen AI solutions
- Understanding of ethical considerations and future trends
- Experience in developing Gen AI-powered business solutions

LEARNING OBJECTIVES

Upon successful completion of this course, students will be able to:

1. Explain the fundamental concepts and architecture of Generative AI systems
2. Develop effective prompts for various business applications
3. Mastery in multimedia generation using state-of-the-art AI tools.
4. Evaluate and implement Gen AI solutions across different business functions

5. Analyze ethical implications and security considerations of Gen AI deployment
6. Create Gen AI-powered solutions for real-world business challenges
7. Understand the transition from current Gen AI to future Agentic AI systems
8. Build and present a functional Generative AI artifact for a business use case.

COURSE POLICIES

Prerequisites

- Basic understanding of artificial intelligence concepts
- Familiarity with business information systems
- Programming knowledge (Suach as Python) is recommended but not required

Attendance and Participation

- Regular attendance at lectures is mandatory
- Active participation in case discussions is expected
- All assignments must be submitted by the specified deadlines

Academic Integrity

- All submitted work must be original
- Proper citation of sources is required
- Collaboration guidelines will be provided for group projects

DETAILED MODULES OVERVIEW

Week 1: Foundations of Generative AI and NLP

Module Description:
Introduction to fundamental concepts of Generative AI and Natural Language Processing, establishing core understanding of the technology and its business implications.

Topics Covered:

- Evolution from Traditional AI to Generative AI
    - Historical development of AI
    - Breakthrough technologies
    - Current state of the field
- Natural Language Processing Fundamentals
    - Tokenization and embeddings
    - Language models and their evolution
    - Transfer learning in NLP
- Types of Generative AI Models

    - Large Language Models (LLMs)
    - Diffusion Models
    - Generative Adversarial Networks (GANs)
- Business Implications
    - Market landscape analysis
    - Industry adoption patterns
    - Success stories and failures

Learning Outcomes:

1. Explain the evolution from traditional AI to Generative AI
2. Describe key components of NLP systems
3. Differentiate between various types of Gen AI models
4. Analyze current market landscape
5. Evaluate potential business applications

Required Readings:

1. "Introduction to Natural Language Processing" (Eisenstein, 2019)
2. "Deep Learning for NLP and Speech Recognition" (Kamath et al., 2019)
3. Selected articles from MIT Sloan Management Review on Gen AI

Week 2: Applied Foundations

- Case Study: " Khanmigo: Revolutionizing Learning with GenAI”
- Harvard Business School Case
- Authors: William A. Sahlman; Allison M. Ciechanover; Emily Grandjean

Supporting Case: "Microsoft Azure and Cloud Infrastructure"

Assignment Details:

1. Business Process Analysis Project
    - Document current state of selected business process
    - Identify Gen AI integration opportunities
    - Develop implementation roadmap
    - Create cost-benefit analysis

Deliverables:

- Case analysis report (500 words)
- Process analysis presentation (15 minutes)
- Implementation proposal document

Assessment Criteria:

- Understanding of case concepts (30%)
- Quality of analysis (30%)
- Implementation feasibility (25%)
- Presentation clarity (15%)

Week 3: Architecture of Generative AI

Module Description:
Technical deep-dive into Gen AI architecture, focusing on core components and implementation considerations.

Topics Covered:

- Deep Learning Architectures
    - Transformer architecture
    - Attention mechanisms
    - Multi-head attention
- Training Methodologies
    - Pre-training approaches
    - Fine-tuning techniques
    - Few-shot and zero-shot learning
- System Integration
    - API integration patterns
    - Microservices architecture
    - Scaling considerations

Learning Outcomes:

1. Understand transformer architecture components
2. Explain different training methodologies
3. Design system integration plans
4. Evaluate architectural choices
5. Assess scaling requirements

Required Readings:

1. "Attention Is All You Need" (Vaswani et al., 2017)
2. "Language Models are Few-Shot Learners" (Brown et al., 2020)
3. Selected technical documentation from leading AI platforms

Week 4: Architecture Applications

Case Study: " Zest AI: Machine Learning and Credit Access"

- Harvard Business School Case

- Authors: David S. Scharfstein; Ryan Gilland
- **Supporting Case:** "Predicting Consumer Tastes with Big Data at Gap"

Assignment Details:

1. Architecture Design Project
    - System architecture proposal
    - Integration planning
    - Scaling strategy
    - Security considerations

Deliverables:

- Technical design document
- Architecture diagrams
- Implementation roadmap
- Presentation of proposed solution

Week 5: Gen AI and Multimedia Generation

Module Description:
Comprehensive exploration of multimedia generation capabilities, focusing on various content types and business applications.

Topics Covered:

- Multimodal AI Models
    - Image generation technologies
    - Audio synthesis systems
    - Video generation frameworks
    - Code generation tools
- Cross-modal Generation
    - Text-to-image systems
    - Image-to-text capabilities
    - Multimodal transformers
- Business Applications
    - Content creation workflows
    - Marketing applications
    - Product visualization
    - Technical documentation

Learning Outcomes:

1. Understand multimodal AI architectures
2. Implement cross-modal generation systems
3. Evaluate content quality

4. Design multimedia workflows
5. Assess business applications

Required Readings:

1. "Multimodal Deep Learning" (Baltrusaitis et al., 2019)
2. "State of the Art in Neural Content Generation" (IEEE Review, 2023)
3. Industry white papers on multimedia AI

Week 6: Multimedia Applications

Case Study: " How People Are Really Using GenAI"

- Harvard Business School Case Study
- Authors: Andy Wu, Matt Higgins

Assignment Details:

1. Multimedia Generation Project
    - Content creation pipeline design
    - Quality assessment framework
    - Integration strategy
    - Business value analysis

Deliverables:

- Generated content portfolio
- Technical documentation
- Quality metrics report
- Business impact assessment

Week 7: Prompt Engineering Techniques

Module Description:
Advanced study of prompt engineering methodologies, focusing on optimization techniques and business applications.

Topics Covered:

- Prompt Engineering Fundamentals
    - Basic prompt structure
    - Context and conditioning
    - Temperature and sampling
    - Response formatting
- Advanced Techniques

    - Chain-of-thought prompting
    - Few-shot examples
    - Zero-shot prompting
    - System prompting
    - Constitutional AI principles
- Business Applications
    - Domain-specific prompting
    - Technical writing
    - Content generation
    - Data analysis

Learning Outcomes:

1. Design effective prompts for business contexts
2. Implement advanced prompting techniques
3. Optimize prompt performance
4. Develop prompt libraries
5. Evaluate prompt effectiveness

Required Readings:

1. "Prompt Engineering for Effective Model Usage" (OpenAI Documentation)
2. "Chain-of-Thought Prompting Elicits Reasoning in Large Language Models" (Wei et al., 2022)
3. Selected technical papers on prompt engineering

Week 8: Prompt Engineering Applications

Case Study: " Using Prompt Engineering to Better Communicate with People"

- Harvard Business School
- Author: Josh Morton

Supporting Case: “An executive's guide to generative AI: Finding the right use cases and crafting effective prompts” By Sandra Sieber

Assignment Details:

1. Prompt Engineering Project
    - Develop enterprise prompt library
    - Create optimization framework
    - Test and validate prompts
    - Document best practices

Deliverables:

- Prompt engineering handbook
- Performance analysis report
- Template library
- Implementation guidelines

Week 9: Applications of Gen AI in Different Industries

Module Description:
Comprehensive analysis of Gen AI applications across various industries and sectors.

Topics Covered:

- Industry-Specific Applications
    - Financial services implementations
    - Healthcare solutions
    - Manufacturing use cases
    - Retail applications
    - Professional services
- Implementation Strategies
    - Integration methodologies
    - Change management
    - User adoption
    - Performance measurement
- Impact Analysis
    - ROI frameworks
    - KPI development
    - Success metrics
    - Risk assessment

Learning Outcomes:

1. Analyze industry-specific applications
2. Develop implementation strategies
3. Create measurement frameworks
4. Assess success factors
5. Evaluate risks and challenges

Required Readings:

1. "AI Transformation Playbook" (Andrew Ng, 2018)
2. "The State of AI in Enterprise" (MIT Sloan Review, 2023)
3. Industry-specific case studies

Week 10: Industry Applications

- Case Study: " Fixie and Conversational AI Sidekicks"
- Harvard Business School Case
- Authors: Jeffrey J. Bussgang; Carin-Isabel Knoop

Assignment Details:

1. Industry Analysis Project
    - Sector-specific analysis
    - Implementation strategy
    - ROI modeling
    - Risk assessment

Deliverables:

- Industry analysis report
- Implementation roadmap
- Financial models
- Risk mitigation plan

Week 11: Transition from Gen AI to Agentic AI

Module Description:
Exploration of autonomous AI systems and their business implications.

Topics Covered:

- Agentic AI Fundamentals
    - Autonomous systems
    - Multi-agent frameworks
    - Decision-making algorithms
    - Goal-oriented behavior
- Business Implications
    - Organizational impact
    - Process automation
    - Human-AI collaboration
    - Skills requirements
- Future Scenarios
    - Technology roadmap
    - Industry evolution
    - Workforce transformation

Learning Outcomes:

1. Understand agentic AI principles
2. Evaluate business impact
3. Develop transition strategies

4. Assess organizational readiness
5. Plan future scenarios

Required Readings:

1. "The Age of Autonomous AI" (Nature Machine Intelligence, 2023)
2. "Multi-Agent Systems in Business" (MIS Quarterly, 2023)
3. Selected papers on autonomous systems

Week 12: Agentic AI Applications

Case Study: "Autonomous Vehicles: The Future of Transportation" by Elie Ofek; Akhil Waghmare

- Supporting Case: " What Is Agentic AI, and How Will It Change Work? By Mark Purdy

Assignment Details:

1. Agentic AI Strategy Project
    - Develop transition plan
    - Create capability roadmap
    - Assess organizational impact
    - Plan implementation phases

Deliverables:

- Strategy document
- Impact assessment
- Implementation plan
- Change management framework

Week 13: Gen AI, Ethics, Security, and Future Perspectives

Module Description:
Analysis of ethical considerations, security challenges, and future trends.

Topics Covered:

- Ethical Considerations
    - Bias and fairness
    - Transparency
    - Accountability
    - Social impact
- Security Challenges
    - Data protection

    - Model security
    - Attack vectors
    - Defense strategies
- Future Trends
    - Technology evolution
    - Regulatory landscape
    - Market dynamics
    - Societal impact

Learning Outcomes:

1. Evaluate ethical implications
2. Develop security frameworks
3. Assess future trends
4. Create governance models
5. Plan for emerging challenges

Required Readings:

1. "Ethics of Artificial Intelligence" (Oxford Handbook, 2023)
2. "AI Security: Threats and Countermeasures" (IEEE Security, 2023)
3. Selected papers on AI ethics and security

Week 14: Ethics and Security Applications

- Case Study: " Blazing New Trails: Responsible Generative AI and the Creative Adoption of a Large Language Model at Deloitte Canada"
- Harvard Business School Case
- Authors: Marion KOROSEC-SERFATY; Luc Lesperance

Assignment Details:

1. Ethics and Security Project
    - Develop ethics framework
    - Create security protocol
    - Design governance structure
    - Plan compliance strategy

Deliverables:

- Ethics guidelines
- Security assessment
- Governance framework
- Compliance documentation

Week 15: Final Project – Building an Artifact Using Generative AI: Preparation Stage

Module Description:
Integration of course concepts into a comprehensive business solution.

Project Requirements:

- Business Case Development
  - Problem definition
  - Solution design
  - Implementation planning
  - Impact assessment
- Technical Implementation
  - System architecture
  - Integration strategy
  - Security measures
  - Quality assurance
- Documentation
  - Technical documentation
  - User guidelines
  - Training materials
  - Maintenance plans

Learning Outcomes:

1. Apply course concepts holistically
2. Develop complete solutions
3. Create comprehensive documentation
4. Present professional deliverables
5. Demonstrate business value

Week 16: Final Project Presentation

Module Description:
Final presentation and defense of Gen AI business solutions.

Presentation Requirements:

- Technical Demonstration (20 minutes)
  - Solution overview
  - Implementation details
  - Performance metrics
  - Future roadmap
- Q&A Session (10 minutes)

    - Technical defense
    - Business justification
    - Implementation planning
    - Risk management

Assessment Criteria:

- Technical Implementation (40%)
- Business Value (30%)
- Presentation Quality (20%)
- Documentation (10%)

Final Deliverables:

- Complete solution documentation
- Technical implementation
- Presentation slides
- Project report
- Video demonstration