	Faculty of Engineering and Natural Sciences *Computer/Software Engineering Department*	**Syllabus**

COURSE INFORMATION

Academic Year / Semester		2024 – 2025 / Spring
Course Code, Name, Credit (T-A-C)		1413002045 Generative Artificial Intelligence (3-0-3) 1410002004 Yapay Zeka (3-0-3)
Lecture and Lab Schedules	**Theoretical**	3 hours
	Lab	Some Flip-Learning class activities
Course Type		Elective
Prerequisite		• Python and good programming skills • …
Day/Time and Class		**Monday:** 09:00 – 11:50 / **C2-03**

ACADEMIC PERSONAL

Title / First and Last Name	Prof. Dr. Haluk Gümüşkaya
Room	A7-12 (on Mondays)
E-Mail Address / Web Page	**E-mail:** haluk.gumuskaya@atlas.edu.tr and haluk@gumuskaya.com **Course Web Page:** Google Classroom (be announced in class)
Telephone	0850 450 3439-1316 / 444 34 39 - 1316
Office Hours	TBA
Assistant	-

COURSE DESCRIPTION

This is an introductory course in Generative Artificial Intelligence. It makes a broad introduction to many concepts, technologies and practical work in Generative Artificial Intelligence. The following selected topics are presented in the course: Image Captioning with Generative AI, Create Your Own ChatGPT-Like Website, Create a Voice Assistant, Generative AI-Powered Meeting Assistant, Summarize Your Private Data with Generative AI and RAG, Babel Fish (Universal Language Translator) with LMM and STT TSS, Intoduction to LLM Agents, LangChain for LLM Application Development

COURSE OBJECTIVES

Upon successful completion of the course, the student is expected to learn and apply: (TBD)

- ….

COURSE TEXTBOOK AND OTHER MATERIALS

Main Textbooks and Resources	No single textbook and other resource are strictly followed. We will excessively use many references, online materials (video lectures, blog, posts, surveys, papers, etc.). I prepare my own lecture slides and other materials from several resources. The following books' some parts and Python Jupyter Notebook examples will be used to learn and develop practical Generative AI applications:
Tools	Python and PyCharm (Professional Edition) (Python IDE)

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WEEKLY LECTURE SCHEDULE (tentative)

W/D	Topics Covered	Activities
1 **10/Feb**	**01-Course Overview and Introduction** **01.1-Course Overview** Requirements and Assumptions, Course Description and Objectives, Course Activities and Grading, Lectures and Activities Schedule, Course Project, Course Web Site, Course Materials and References, Policies and Regulations **01.2-Introduction to Generative AI and LLMs** Artificial Intelligence vs. Machine Learning, What is Generative AI?, Generative AI Model Types, Generative AI Development Applications, What are Large Language Models (LLMs)?, How Large Language Models are Trained?, Pathways Language Model (PaLM), A Typical LLM Use Case: Question Answering, Kinds of LLMs, Tuning a Model	**Getting Started:** - Register for Edx-IBM course: *Developing Generative AI Applications with Python* - Start the course and go over the first module. **01.3-Introduction to AL, ML, DL and Gen AI**, AI in the News, What is Artificial Intelligence? What is Machine Learning? Machine Learning Knowledge Areas, Types of Learning, What is Data Mining? What is Deep Learning? What is Generative AI?
2 **17/Feb**	**02.1-Intro to Generative AI-Powered Applications** Introduction to Gen AI Projects, Generative AI Models, Foundation Models **02.2-Image Captioning with Generative AI** Introduction to the Image Captioning Project, Hugging Face, Getting Started with BLIP on Hugging Face, Real-Time Use Case: Automated Photo Captioning, Visual Question Answering, Introduction to Gradio, Use Case: Image Captioning, Usase: Image Classification	**HW1: Introduction to Generative AI and LLM Applications: Developing Generative AI Applications with Python-1**
3 **24/Feb**	**03-Create Your Own ChatGPT-Like Website** Introduction to the Chatbot Project, Create Simple Chatbot with Open Source LLMs using Python and Hugging Face, Create Simple Chatbot with Open Source LLMs using Python and Hugging Face, Conversation Details, Integrating your Chatbot into a Web Interface, Communicating with your Backend using a Webpage, Developing a ChatGPT-like Website using Gradio	**HW2: Developing Generative AI Applications with Python-2: Create Your Own ChatGPT-Like Website**
4 **3/Mar**	**04-Create a Voice Assistant** Project Overview: Create a Voice Assistance, Introduction to Docker, IBM Watson Speech-to-Text and Text-to-Speech, OpenAI GPT-3, Lab: Create a Voice Assitant with OpenAI's GPT-3 and IBM Watson, Project Summary: Create a Voice Assistant , Quiz-3	**HW3: Developing Generative AI Applications with Python-3: Create a Voice Assistant**

4 3/Mar	05-Generative AI-Powered Meeting Assistant Project Overview, IBM Watsonx.ai, Introduction to Meta Llama 2, Introduction to OpenAI Whisper, Lab: Business-AI Meeting Companion, Summary	**HW4: Developing Generative AI Applications with Python-4: Generative AI-Powered Meeting Assistant**
5 **10/Mar**	**06-Summarize Your Private Data with Generative AI and RAG** Project Overview, Introuduction to LangChan, Enhancing LLM Accuracy with RAG, Introduction to Llama 2 and RAG, Lab: Build a Chatbot for Your Data, Summary	**HW5: Developing Generative AI Applications with Python-5: Summarize Your Private Data with Generative AI and RAG**
6 **17/Mar**	**07-Babel Fish (Universal Language Translator) with LMM and STT TSS** Introduction to Project: Babel Fish with LLM and STT TTS, Lab: Babel Fish (Language Translator) with LLM STT & TTS, Summary, Quiz	**HW6: Developing Generative AI Applications with Python-6: Babel Fish (Universal Language Translator) with LMM and STT TSS**
7 **24/Mar**	Midterm Exam Week	
8 **31/Mar**	Ramazan Bayramı (30-03 – 1-04-2025)	
9 **7 Apr**	**08.1-Intoduction to LLM Agents** What are LLM Agents?, Memory, Tools, Planning, Multi-Agent Collaboration, Multi-Agent Frameworks, 2025 AI Agents Infrastructure Stack, RAG Architectures	**08.2-AI-Intelligent Agents** Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments: PEAS, The Structure of Agents
10 **14 Apr**	**09-LangChain for LLM Application Development** ***01-Models, Prompts and Parsers*** ***02-Memory***	
11 **21 Apr**	**09-LangChain for LLM Application Development** ***03-Chains*** ***04-Questions and Answers***	
12 **28 Apr**	**09-LangChain for LLM Application Development** ***05-Evaluation*** ***06-Agents***	
13 **5 May**	**09-LangChain for LLM Application Development** ***06-Agents (cont'ed)***	

14 **12 May**	**Project Demonstrations**	
20 May **31 May**	Final Exams Week	
	Kurban Bayramı (6-6 – 9-6-2025)	
16 June	Final Makeup Exams Week	

GRADING (tentative)

Practical Part (mostly team work): ~ %70 in Grading

- **%30: Homework (Ödev)**
  %20: HW Assignments and FL Activities
  %10: ADC (Attendance/Discussion/Contribution)
- **%30: Project (Proje)**

Theoretical Part: ~ %30 in Grading

- **%40: Final Exam (Yıl Sonu Sınavı)**

Final Exam: %75 Written Final Exam Grade + %25 Project Grade