



Course Specification

(Bachelor)

Course Title: **AI Application Development**

Course Code: **SE3604**

Program: **BSc in Software Engineering**

Department: **Software Engineering**

College: **College of Computing**

Institution: **Umm Al Qura University**

Version: **1.0**

Last Revision Date: **22/04/2025**



Table of Contents

A. General information about the course:	3
B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods	4
C. Course Content	5
D. Students Assessment Activities	6
E. Learning Resources and Facilities	6
F. Assessment of Course Quality	7
G. Specification Approval	7



A. General information about the course:

1. Course Identification

1. Credit hours: (3)

2. Course type

A. University College Department Track Others
B. Required Elective

3. Level/year at which this course is offered: (3rd year/ 5th or 6th level) or (4th year/8th level)

4. Course General Description:

This course introduces students to the principles and practices of developing artificial intelligence (AI) applications. Students will explore cutting-edge AI technologies with a focus on Large Language Models (LLMs) and other practical AI systems. The course covers the end-to-end AI application development lifecycle, including problem identification, data preparation, model building, deployment, and integration into software systems.

5. Pre-requirements for this course (if any):

SE2301 - Software Modelling and Analysis

6. Co-requisites for this course (if any):

N/A

7. Course Main Objective(s):

Learning Outcomes:

1. Develop and deploy AI-based software applications using modern frameworks and technologies.
2. Understand the theoretical foundations of AI and its practical applications.
3. Identify and address ethical and societal challenges associated with AI systems.
4. Integrate AI functionalities into existing software systems.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning	0	0
3	Hybrid	0	0



No	Mode of Instruction	Contact Hours	Percentage
	<ul style="list-style-type: none"> Traditional classroom E-learning 		
4	Distance learning	0	0

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	30
3.	Field	0
4.	Tutorial	0
5.	Others (specify)	0
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Understand the theoretical foundations of AI and machine learning	K1	Lecture, excercise	Quizz, Labs ,Exam
1.2	Learn the architecture and functionality of Large Language Models (LLMs)	K1	Lecture, excercise	Quizz, Labs ,Exam
1.3	Explore the integration of AI into software systems and cloud-based solutions	K3	Lecture, excercise	Quizz, Labs ,Exam
2.0	Skills			
2.1	Develop and deploy AI-driven software applications using modern tools and frameworks	S1	Lecture, excercise	Quizz, Labs Project ,Exam



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.2	Implement natural language processing (NLP) and computer vision tasks	S1	Lecture, exercise	Quizz, Labs Project ,Exam
2.3	Fine-tune pre-trained AI models for domain-specific applications	S2	Lecture, exercise	Quizz, Labs Project ,Exam
3.0	Values, autonomy, and responsibility			
3.1	Commit to ethical and responsible AI development practices	V1	Lecture, exercise	Quizz, Labs Project ,Exam
3.2	Promote inclusivity and fairness in AI-driven decision-making processes	V2	Lecture, exercise	Quizz, Labs Project ,Exam
3.3				

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Artificial Intelligence: Overview, types of AI, and its role in software engineering	4
2.	Machine Learning Basics: Supervised, unsupervised, reinforcement learning, and tools (TensorFlow, PyTorch)	4
3.	Large Language Models and NLP: LLMs (e.g., GPT, BERT), NLP tasks, and chatbots	8
4.	AI Application Development Lifecycle: Problem identification, dataset preparation, and model deployment	4
5.	Integration of AI in Software Systems: Embedding AI in web/mobile apps, API-based integration	4
6.	Computer Vision and Image Processing: Object detection, face recognition, and OpenCV/Yolo frameworks	4
7.	AI in Decision-Making and Automation: AI-driven decision support and robotic process automation (RPA)	4
8.	Ethical and Legal Considerations in AI: Bias, fairness, privacy, and ethical frameworks	4
9.	Advanced AI Application Development: Multimodal AI, reinforcement learning, IoT, and edge computing	8





10.	Scalable and Cloud-Based AI Applications: Serverless computing and scalable data pipelines	4
11.	Testing and Debugging AI Systems: Debugging models, testing for accuracy, and CI/CD in AI development	4
12.	Capstone Project: Full-cycle development, implementation, and presentation of an AI-based application	8
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments and Quizzes	2-14	15
2.	Projects	2-14	15
3.	Practicals	2-14	10
4.	Mid Term	7	20
5.	Final Exam	16-17	40

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	<ul style="list-style-type: none"> Huyen, C. (2024). <i>AI engineering: Building Applications with Foundation Models</i>. "O'Reilly Media, Inc." Russell, S., & Norvig, P. (2020). <i>Artificial intelligence: A modern approach</i> (4th ed.). Pearson. ISBN 978-0134610993. Géron, A. (2019). <i>Hands-on machine learning with Scikit-Learn, Keras, and TensorFlow: Concepts, tools, and techniques to build intelligent systems</i> (2nd ed.). O'Reilly Media. ISBN 978-1492032649. Rao, D., & McMahan, B. (2019). <i>Natural language processing with PyTorch: Build intelligent language applications using deep learning</i>. O'Reilly Media. ISBN 978-1491978238.
Supportive References	<ul style="list-style-type: none"> Kleppmann, M. (2017). <i>Designing data-intensive applications: The big ideas behind reliable, scalable, and maintainable systems</i>. O'Reilly Media. ISBN 978-1449373320. (oreilly.com)





Electronic Materials

Other Learning Materials

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Traditional Classroom
Technology equipment (projector, smart board, software)	Multimedia Projector
Other equipment (depending on the nature of the specialty)	N/A

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct, Indirect
Effectiveness of Students' assessment	Faculty, Peer reviewer	Direct, Indirect
Quality of learning resources	Faculty, Course coordinator	Direct, Indirect
The extent to which CLOs have been achieved	Course coordinator, Program management committee	Direct
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	SOFTWARE ENGINEERING DEPARTMENT COUNCIL
REFERENCE NO.	THE 17 TH MEETING FOR THE ACADEMIC YEAR 1446H
DATE	22/04/2025

