Module (Course Syllabus) Catalogue

2025-2026

College/ Institute	**Erbil Polytechnic University**	
Department	Information System Engineering Techniques	
Module Name	Artificial Intelligence	
Module Code	ARI702	
Degree	**Technical Diploma** ☐ **Bachelor** ■ **High Diploma** ☐ **Master** ☐ **PhD** ☐	
Semester	7th semester, 4th stage	
Qualification	PhD	
Scientific Title	Asst. Prof.	
ECTS (Credits)	6	
Module type	**Prerequisite** ☐ **Core** ■ **Assistant** ☐	
Weekly hours		
Weekly hours (Theory)	**(2) hr Class**	**(84) Total hrs Workload**
Weekly hours (Practical)	**(2) hr Class**	**(78) Total hrs Workload**
Number of Weeks	**14**	
Lecturer (Theory)	Dr. Ismael Abdulrahman	
E-Mail & Mobile NO.	ismael.abdulrahman@epu.edu.iq	
Lecturer (Practical)	Mr. Rasty Shaxawan Majeed rasti.shaxawan@epu.edu.iq	
E-Mail & Mobile NO.	Ms. Zhwan Mohammed Khalid zhwan.khalid@epu.edu.iq	
Websites		

Course Book

Course Description	This course offers an introduction to the core concepts, techniques, and applications of Artificial Intelligence (AI). Students will gain both theoretical knowledge and practical experience, exploring topics such as symbolic reasoning, neural networks in depth, computer vision, natural language processing (NLP), reinforcement learning, and more. Hands-on labs using TensorFlow and PyTorch will reinforce learning, while discussions on responsible AI will cultivate a critical and ethical approach to AI development. The course is aimed at beginners with foundational programming skills, particularly in **Python**. **Note: Assessment criteria may be subject to change, including temporary modifications to point allocations.**
Course objectives	By the end of the course, students will be able to: • Understand the historical development and fundamental concepts of AI. • Apply symbolic approaches to knowledge representation and reasoning. • Build and train neural networks using PyTorch and TensorFlow. • Implement AI models for computer vision and natural language processing tasks. • Explore advanced AI topics such as generative models, reinforcement learning, and multi-agent systems. • Critically analyze ethical challenges in AI development and deployment.
Student's obligation	• Attend all lectures and practical lab sessions. • Complete pre-readings and assigned exercises before each class. • Submit lab reports and assignments on time. • Participate actively in discussions and group projects. • Maintain academic honesty and cite all references appropriately. • Prepare for quizzes, midterm, and final examinations.

<table>
<tr><td>Required Learning Materials</td><td colspan="5">Software/Tools:

• Python 3.x
• Jupyter Notebook
• PyTorch, TensorFlow, Keras
• OpenCV</td></tr>
<tr><td rowspan="11">Evaluation</td><td colspan="2">Task</td><td>Weight (Marks)</td><td>Due Week</td><td>Relevant Learning Outcome</td></tr>
<tr><td colspan="2">Paper Review</td><td></td><td></td><td></td></tr>
<tr><td rowspan="6">Assignments</td><td>Homework</td><td>5</td><td></td><td></td></tr>
<tr><td>Class Activity</td><td>2</td><td></td><td></td></tr>
<tr><td>Report</td><td>5</td><td></td><td></td></tr>
<tr><td>Seminar</td><td></td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td></td><td></td></tr>
<tr><td>Project</td><td>5</td><td></td><td></td></tr>
<tr><td colspan="2">Quiz</td><td>8</td><td></td><td></td></tr>
<tr><td colspan="2">Lab.</td><td>10</td><td></td><td></td></tr>
<tr><td colspan="2">Midterm Exam</td><td>25</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>40</td><td></td><td></td></tr>
<tr><td colspan="2">Total</td><td>100</td><td></td><td></td></tr>
<tr><td>Specific learning outcome:</td><td colspan="5">Upon completion, students will be able to:

• Understand the difference between symbolic AI and neural network-based AI.
• Build and train perceptrons, multi-layer perceptrons, CNNs, and RNNs.
• Apply transfer learning and fine-tuning for image tasks.
• Represent and process text using word embeddings and transformer models.
• Create small AI projects combining computer vision and NLP.
• Assess AI systems for accuracy, performance, and ethical considerations.</td></tr>
<tr><td>Course References:</td><td colspan="5">• Russell, S., & Norvig, P. Artificial Intelligence: A Modern Approach (4th Global Edition).
• Géron, A. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow.
• Elgendy, M. Deep Learning for Vision Systems.
• Microsoft. AI for Beginners Curriculum (Open Source).

Online Course Resource: AI for Beginners Curriculum – Microsoft</td></tr>
</table>

Course topics (Theory)	Week	Learning Outcome

Throughout this 14-week course, students will explore the foundations and applications of Artificial Intelligence, starting with the history and evolution of AI and the main paradigms that have shaped the field. The curriculum introduces symbolic AI, including knowledge representation and reasoning, and progresses to neural network fundamentals such as perceptrons, multi-layered perceptrons, and modern frameworks like PyTorch and TensorFlow. Students will learn essential concepts in computer vision, including convolutional networks, transfer learning, autoencoders, and generative models, as well as natural language processing techniques ranging from text representation to transformers and large language models. Advanced topics, such as genetic algorithms, reinforcement learning, and multi-agent systems, will provide insights into diverse AI approaches, while discussions on AI ethics and responsible AI ensure students appreciate the societal and ethical implications of these technologies.

Note:

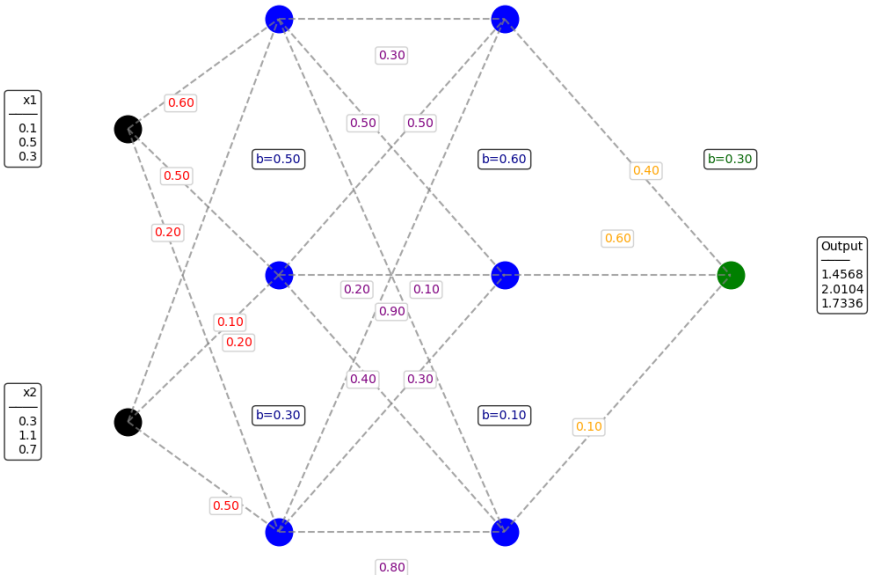
This syllabus serves as a flexible guide and may be adjusted based on the class's pace and students' depth of understanding. Practical demonstrations, guest lectures, and real-world applications will be incorporated to enhance the learning experience.

Practical Topics	Week	Learning Outcome

- Introduction to Python
- Labs for perceptron, MLP, CNNs, RNNs, and transformers.
- Projects on computer vision (image classification, object detection).
- Projects on NLP (text classification, NER).
- Reinforcement learning game simulation.
- Ethical case studies and presentations.

19. Examinations (samples of questions)

Q: Compute the first epoch of gradient descent for the following network.



Q: Describe the architecture below:

Layer (type)	Output Shape	Param #
conv2d_1 (Conv2D)	(None, 32, 32, 32)	896
activation_1 (Activation)	(None, 32, 32, 32)	0
batch_normalization_1 (batch	(None, 32, 32, 32)	128
conv2d_2 (Conv2D)	(None, 32, 32, 32)	9248
activation_2 (Activation)	(None, 32, 32, 32)	0
batch_normalization_2 (batch	(None, 32, 32, 32)	128
max_pooling2d_1 (MaxPooling2	(None, 16, 16, 32)	0
dropout_1 (Dropout)	(None, 16, 16, 32)	0
conv2d_3 (Conv2D)	(None, 16, 16, 64)	18496
activation_3 (Activation)	(None, 16, 16, 64)	0
batch_normalization_3 (batch	(None, 16, 16, 64)	256
conv2d_4 (Conv2D)	(None, 16, 16, 64)	36928
activation_4 (Activation)	(None, 16, 16, 64)	0
batch_normalization_4 (batch	(None, 16, 16, 64)	256
max_pooling2d_2 (MaxPooling2	(None, 8, 8, 64)	0
dropout_2 (Dropout)	(None, 8, 8, 64)	0
conv2d_5 (Conv2D)	(None, 8, 8, 128)	73856
activation_5 (Activation)	(None, 8, 8, 128)	0
batch_normalization_5 (batch	(None, 8, 8, 128)	512
conv2d_6 (Conv2D)	(None, 8, 8, 128)	147584
activation_6 (Activation)	(None, 8, 8, 128)	0
batch_normalization_6 (batch	(None, 8, 8, 128)	512
max_pooling2d_3 (MaxPooling2	(None, 4, 4, 128)	0
dropout_3 (Dropout)	(None, 4, 4, 128)	0
flatten_1 (Flatten)	(None, 2048	0
dense_1 (Dense)	(None, 10)	20490

Extra notes:

This course book is subject to change. Topics may be added, removed, postponed, or reordered to best support students' understanding of the course concepts.

I am available to discuss class material and assignment questions. You are welcome to visit my office during my scheduled hours.

Cheating is strictly prohibited. According to the Academic Honesty policy, a first offense will result in a failing grade on the assignment, and a second offense will result in failing the course. If you are unsure about what constitutes cheating or plagiarism, or if stress is leading you to consider this, please come to my office to discuss it.

My goal is not only to teach you the principles of electricity but also to spark your curiosity about how the Earth works. Please do not hesitate to share suggestions on how I can improve your learning experience. I am committed to providing support to help you succeed in this course.

External Evaluator

I confirm that the syllabus given the attached course book is sufficient and covers the required areas needed for the students.