

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Artificial Intelligence		Module Delivery	
Module Type	Elective		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☒ Seminar	
Module Code	CET4106			
ECTS Credits	5			
SWL (hr/sem)	150			
Module Level	4	Semester of Delivery		7
Administering Department	CET	College	EETC	
Module Leader	Ammar Hussein Mutlag		e-mail	ammar_alqiesy@mtu.edu.iq
Module Leader's Acad. Title	Professor		Module Leader's Qualification	PhD
Module Tutor	Dr. Mohammed Joudah Zaiter		e-mail	mjzaiter@mtu.edu.iq
Peer Reviewer Name	Dr. Mahmoud Shuker Mahmoud		e-mail	mahmoud.shukur@mtu.edu.iq
Scientific Committee Approval Date	13/06/2023	Version Number	1.0	

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1- Provides a comprehensive introduction to artificial intelligence (AI) and neural networks. 2- Learn the fundamentals of AI, including problem-solving, reasoning, knowledge representation, and machine-learning techniques. 3- Study the various types of neural networks and their architectures. 4- Demonstrate the applications in real-world scenarios. 5- Gain hands-on experience in implementing and training neural networks using popular frameworks and tools.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Understand the principles and theories underlying artificial intelligence. 2- Explain the concepts of machine learning, including supervised, unsupervised, and reinforcement learning. 3- Demonstrate proficiency in programming languages commonly used in AI and neural network applications. 4- Understand the fundamental concepts and principles of artificial neural networks (ANNs). 5- Explain the architecture and components of different types of ANNs, 6- Design and implement neural network architectures for various tasks, such as classification, regression, and pattern recognition. 7- Train and optimize neural networks using appropriate algorithms and techniques. 8- Evaluate and compare the performance of different neural network models using appropriate evaluation metrics. 9- Understand the limitations and challenges associated with training and deploying neural networks. 10- including feedforward, recurrent, and convolutional neural networks. 11- Optimize ANNs using appropriate algorithms and techniques, such as gradient descent and backpropagation. 12- Explore the applications of ANNs in different fields.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1- Introduction to Artificial Intelligence [5 hrs] History and evolution of AI, AI applications and impact on society, AI problem-solving approaches. 2- Machine Learning Fundamentals [5 hrs] Supervised, unsupervised, and reinforcement learning; Training, validation, and testing of machine learning models; Evaluation metrics for assessing model performance. 3- Neural Networks Basics [25 hrs] Fundamentals of biological Neural Networks, basic principles of ANNs, and their early structures; Properties of ANN, advantages, and disadvantages; Types of learning rules, learning algorithms, training styles

	4- Neural Networks Algorithms [25 hrs] Hebb Network, Perceptron, and activation functions; Feedforward neural networks and backpropagation algorithm; Optimization algorithms (e.g., gradient descent) 5- Introduction to Deep Learning and Convolutional Neural Networks [5 hrs] Introduction to deep learning; Convolutional neural networks (CNNs) and their architectures; Image classification and object recognition using CNNs.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	74	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	76	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	4, 12	LO #1-4 and 5-8
	Seminar	1	10% (10)	13	LO # 6-9
	Projects / Lab.	1	10% (10)	Continuous	All
Summative assessment	Midterm Exam	2 hr	20% (20)	7	LO # 1-7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Artificial Intelligence
Week 2	Machine Learning Fundamentals
Week 3	Fundamentals of Biological Neural Networks, and their early structures
Week 4	Properties of ANN, advantages, and disadvantage
Week 5	Network architectures, logic gates
Week 6	Types of learning rules, learning algorithms, training styles
Week 7	Mid Term Exam
Week 8, 9	Hebb Net, Applications, Character recognition
Week 10	Perception: Architecture, Algorithm, Applications
Week 11	Adaline: Architecture, Algorithm, Applications
Week 12	Mdaline: Architecture, Algorithm
Week 13, 14	Backpropagation Neural Network: Architecture, Algorithm, Applications
Week 15	Introduction to Deep Learning and Convolutional Neural Networks
Week 16	A preparatory week before the Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	McCulloch-Pitts neurons: Logic Functions
Week 2	Hebb Net: Logic Functions (Binary input and output, Binary input and bipolar output, bipolar input and output)
Week 3	Hebb Net: Character recognition (Two-dimensional input pattern with different letters)
Week 4	Perceptron for different logic functions
Week 5	Adaline for different logic functions
Week 6	Backpropagation for different architecture: Logic gate
Week 7	Backpropagation for different architecture: real applications
Week 8	Image classification and object recognition using CNNs.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	"Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig.	No
Recommended Texts	-	No
Websites		

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54). The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.