MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Artificial Intelligence**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UOMU0302051**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	الأنظمة الطبية الذكية		**College**	العلوم	
Module Leader	م.د ميثم نبيل مقداد		**e-mail**	maytham.meqdad@uomus.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	م.د ميثم نبيل مقداد		**e-mail**	maytham.meqdad@uomus.edu.iq	
Peer Reviewer Name	ا.د مهدي عبادي مانع		**e-mail**	mahdi.ebadi@uomus.edu.iq	
Scientific Committee Approval Date	1/9/2025		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	UOMU0302031	**Semester**	3
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. To provide students with an introduction to the field of artificial intelligence (AI) and machine learning (ML). Students will gain a clear understanding of what AI is and how it differs from traditional programming approaches. 2. To familiarize students with the three main types of machine learning: supervised learning, unsupervised learning, and reinforcement learning. Students will understand the differences between these types and their respective applications. 3. Focus on supervised learning, specifically regression and classification. Students will learn the concepts and techniques used for building models that predict continuous values (regression) or assign data points to specific categories (classification). 4. To provide students with a comprehensive understanding of the end-to-end process of building a machine learning pipeline. They will learn about data preprocessing, feature engineering, model selection, and model training. Additionally, the module will cover strategies for troubleshooting common issues that arise during the machine learning process. 5. To equip students with the knowledge and skills required to evaluate the performance of machine learning models. Students will learn various performance metrics, such as accuracy, precision, recall, and F1 score, and understand how to interpret and use them effectively.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the fundamentals of AI and machine learning. 2. Differentiate between traditional programming and machine learning approaches. 3. Explain the applications and impact of AI and ML in various fields. 4. Identify and describe supervised, unsupervised, and reinforcement learning. 5. Apply regression techniques for predicting continuous values. 6. Utilize classification algorithms for assigning data points to categories. 7. Construct a machine learning pipeline and troubleshoot common issues. 8. Evaluate model performance using accuracy, precision, recall, and F1 score. 9. Interpret and analyze model evaluation results for decision-making.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Module 1: Introduction to AI and Machine Learning (12 hours) ● Introduction to AI and its applications ● Overview of machine learning and its types ● Difference between traditional programming and machine learning ● Impact of AI and ML in various fields Module 2: Types of Machine Learning: Supervised, Unsupervised, and Reinforcement Learning (20 hours)

	• Supervised learning: concepts and examples • Unsupervised learning: concepts and applications • Reinforcement learning: principles and real-world applications Module 3: Supervised Learning: Regression and Classification (30 hours) • Introduction to regression and its techniques • Implementation of regression models • Introduction to classification and its techniques Module 4: Building the Machine Learning Pipeline and Troubleshooting Models (24 hours) • Data preprocessing: cleaning, transformation, and normalization • Feature engineering: selection and extraction • Model selection and training • Troubleshooting common issues in machine learning Module 5: Model Evaluation and Performance Metrics (16 hours) • Evaluation metrics: accuracy, precision, recall, F1 score • Interpreting evaluation results and making decisions

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This strategy incorporates lectures and presentations to introduce key concepts, while also emphasizing project-based learning and practical exercises. Students work on hands-on projects, implementing machine learning solutions, and engaging in coding exercises to reinforce their understanding and develop practical skills in AI and machine learning.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7,14	LO # 1-12
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to AI and Machine Learning: An Overview of Concepts and Applications
Week 2	Supervised Learning: Algorithms and Techniques for Predictive Modeling
Week 3	Data Preprocessing: Cleaning, Transformation, and Feature Scaling
Week 4	Regression: Linear regression
Week 5	Optimization
Week 6	Classification Methods: Decision Trees
Week 7	Exam
Week 8	Feature Engineering: Selection, Extraction, and Feature Importance
Week 9	Model Selection and Evaluation: Cross-Validation and Performance Metrics
Week 10	Model Training and Optimization: Regularization, Hyperparameter Tuning, and Validation Set
Week 11	Troubleshooting Machine Learning Models: Overfitting, Underfitting, and Bias-Variance Tradeoff
Week 12	Evaluation Metrics: Accuracy, Precision, Recall, F1 Score, and ROC Curve Analysis
Week 13	A- Interpreting Model Performance: Understanding Confusion Matrices and Business Applications
Week 14	**B-**Interpreting Model Performance: Understanding Confusion Matrices and Business Applications
Week 15	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered

Week 1	Lab 1: Introduction to Python for AI and Machine Learning: Setting up the Environment and libraries
Week 2	Lab 2: Implementing Regression Models using Scikit-learn: Linear Regression
Week 3	Lab 3: Classification Algorithms using Scikit-learn: Building Decision Trees
Week 4	Lab 4: Data Preprocessing and Feature Engineering in Python: Cleaning, Scaling, and Feature Extraction Techniques
Week 5	Lab 5: Model Selection and Training in Python: Cross-Validation and Grid Search for Hyperparameter Tuning
Week 6	Lab 6: Evaluating Model Performance in Python: Computing Accuracy, Precision, Recall, and F1 Score
Week 7	Lab 7: Troubleshooting Machine Learning Models: Addressing Overfitting and Underfitting Issues
Week 8	Lab 8: Practical Project: Building a Machine Learning Pipeline in Python for Real-World Data Analysis

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Machine Learning Bookcamp, Alexey Grigorev.	No
Recommended Texts	Python Data Science Handbook, Jake VanderPlas	No
Websites	https://github.com/microsoft/Data-Science-For-Beginners	

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.