



**FACULTY OF APPLIED SCIENCES**  
**BACHELOR OF SCIENCE IN COMPUTING**  
**LEARNING MODULE OUTLINE**

Academic Year	2025/2026	Semester	2
Module Code	COMP421		
Learning Module	Artificial Intelligence		
Pre-requisite(s)	Nil		
Medium of Instruction	English		
Credits	3	Contact Hours	45 hrs
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**MODULE DESCRIPTION**

The learning module introduces both the theoretical and the practical aspects of artificial intelligence (AI), you will learn the foundational principles that drive these applications and practice implementing some of these systems. The topics include searching heuristics, Markov Decision Processes, Bayesian inference, machine learning. These topics cover a wide range of key topics in modern AI, from deterministic reasoning to reasoning with uncertainty, from rule-based systems to learning-based systems, etc. The main goal of the module is to equip you with the tools to tackle new AI problems you might encounter in life.

**MODULE INTENDED LEARNING OUTCOMES (ILOS)**

On completion of this learning module, students will be able to:

M1.	Summarize and apply fundamental mathematical models in AI (SM2p, EA2p);
M2.	Convert and solve practical problems by fundamental AI techniques (EA2p, EA3p);
M3.	Illustrate and analyse high level concerns of AI, such as inference and learning (SM2p);
M4.	Evaluate and compare different AI models in practical applications (SM2p, EA2p);
M5.	Design and implement novel applications based on existing AI models (EA3p, D4p).

These ILOs aims to enable students to attain the following Programme Intended Learning Outcomes (PILOs):

PILOs	M1	M2	M3	M4	M5
P1. Select and apply proven methods, tools and techniques to the effective and efficient implementation of information systems;	✓				



P2.	Evaluate computer systems in a local area network, and understand the additional requirements for connection to other networks through wide area networks;					
P3.	Be competent in system development in the Internet and the web platform;					
P4.	Work independently to design and implement a relational database, with an emphasis on how to organise, maintain and retrieve information from a DBMS;					
P5.	Acquire essential knowledge in specific fields of computing disciplines including multimedia, security and artificial intelligence;		✓			
P6.	Acquire the perceptive skills needed to understand information presented in the form of UML diagram, flow chart or other industry standard formats;					
P7.	Understand the need for and use of the necessary mathematical techniques;			✓		✓
P8.	Work independently to develop an understanding of, and the knowledge and skills associated with the general support of computer systems and networks;				✓	
P9.	Work as an effective member of a team in the analysis, design and development of software systems;					
P10.	Use project planning and management techniques in systems development;					
P11.	Understand the fundamental and operational issues of computer systems in business environments;					
P12.	Equip with adequate written, oral communication and interpersonal skills;					
P13.	Build the capacity and desire for lifelong learning and to learn advanced and emerging technologies on one's own;					
P14.	(For Enterprise Information Systems specialisation) Gain an in-depth understanding of the information technology related to enterprise information systems, with an emphasis on development of such systems to support business processes;					
P15.	(For Gaming Technology specialisation) Acquire the general and advanced knowledge of current technologies and operating environment in the gaming industry;					
P16.	(For Computer Education specialization) Acquire the general and practical knowledge of computer education and its practicing environment in secondary education.					

#### MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage	Contact Hours
1-2	1. Introduction	6
	1.1 What is computer science	
	1.2 What is artificial intelligence, machine learning, and deep learning	
	1.3 Relationships among CS, AI, ML, and DL	



	1.4 State-of-the-art in AI	
	1.5 Ethical issues of AI	
3-7	2. Reflex-based models: Machine Learning	15
	2.1 From rule-based to learning systems	
	2.2 Unsupervised learning	
	2.3 Supervised learning	
	2.4 Semi-supervised learning	
8-9	3. Variables-based models: Deep learning	6
	3.1 Multilayer Perceptron (MLP)	
	3.2 Convolutional neural networks (CNNs)	
	3.3 More advanced AI techniques	
10-11	4. States-based models: Search Heuristics	6
	4.1 Graph	
	4.2 State space search	
	4.3 DFS, BFS, and A* search	
	4.4 Swarm Intelligence Algorithm	
	4.5 Applications	
12-13	5. Variables-based models: Bayesian Inference	6
	5.1. Conditional probability and Bayes theorem	
	5.2 Bayes reasoning	
	5.3 Bayes networks	
	5.4 Case study	
14-15	6. Applications of AI	6
	6.1 Computer vision	
	6.2 Speech interaction	
	6.3 Natural language understanding	
	6.4 Expert system	
	6.5 Robotics	

## TEACHING AND LEARNING ACTIVITIES

In this learning module, students will work towards attaining the ILOs through the following teaching and learning activities:

Teaching and Learning Activities	M1	M2	M3	M4	M5
T1. Lectures	✓				
T2. Case studies		✓	✓	✓	✓
T3. In-class practice		✓	✓	✓	✓

### ATTENDANCE

Attendance requirements are governed by the Academic Regulations Governing Bachelor's Degree Programmes of the Macao Polytechnic University. Students who do not meet the attendance requirements for the learning module shall be awarded an 'F' grade.

### ASSESSMENT

In this learning module, students are required to complete the following assessment activities:

Assessment Activities	Weighting (%)	AHEP3 LOs	ILOs to be Assessed
A1. Assignment	25%	SM2p, EA3p, D4p	M2 M3 M4 M5
A2. Test	25%	SM2p, EA2p, EA3p	M1 M2 M3
A3. Examination	50%	SM2p, EA2p, EA3p	M1 M2 M3

The assessment will be conducted following the University's Assessment Strategy (see [www.mpu.edu.mo/teaching\\_learning/en/assessment\\_strategy.php](http://www.mpu.edu.mo/teaching_learning/en/assessment_strategy.php)). Passing this learning module indicates that students will have attained the ILOs of this learning module and thus acquired its credits.

Students with an overall score of less than 35 in the coursework must take the re-sit examination even if the overall score for the module is 50 or above.

Students with a score of less than 35 in the final examination must take the re-sit examination even if the overall score for the module is 50 or above.

Students with an overall final grade of less than 35 are NOT allowed to take the re-sit examination.

### REQUIRED READINGS

### REFERENCES

1. Stuart Russell (2020). *Artificial Intelligence: A Modern Approach (4th ed.)* Pearson.
2. Aurélien Géron (2019) *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent (3<sup>rd</sup> ed.)* O'Reilly Media.

### STUDENT FEEDBACK



At the end of every semester, students are invited to provide feedback on the learning module and the teaching arrangement through questionnaires. Your feedback is valuable for instructors to enhance the module and its delivery for future students. The instructor and programme coordinators will consider all feedback and respond with actions formally in the annual programme review.

### **ACADEMIC INTEGRITY**

The Macao Polytechnic University requires students to have full commitment to academic integrity when engaging in research and academic activities. Violations of academic integrity, which include but are not limited to plagiarism, collusion, fabrication or falsification, repeated use of assignments and cheating in examinations, are considered as serious academic offenses and may lead to disciplinary actions. Students should read the relevant regulations and guidelines in the Student Handbook which is distributed upon the admission into the University, a copy of which can also be found at [www.mpu.edu.mo/student\\_handbook/](http://www.mpu.edu.mo/student_handbook/).