COURSE SYLLABUS

CSC14003 – Introduction to Artificial Intelligence

1. GENERAL INFORMATION

Course name:	Introduction to Artificial Intelligence
Course name (in Vietnamese):	Cơ sở Trí tuệ nhân tạo
Course ID:	CSC14003
Knowledge block:	Compulsory course
Number of credits:	4
Credit hours for theory:	45
Credit hours for practice:	30
Credit hours for self-study:	90
Prerequisite:	None
Prior-course:	Data Structures and Algorithms
Instructors:	Bui Tien Len, PhD Ngoc-Thao Nguyen, PhD Nguyen Tien Huy, PhD Bui Duy Dang, PhD

2. COURSE DESCRIPTION

The course is designed to provide students with a foundational understanding of Artificial Intelligence (AI) through the perspective of a rational agent. The content is organized into three parts, reflecting the evolution of agents' capabilities. Part I: Search explores how agents effectively accomplish tasks by applying various search strategies across diverse environments, considering factors like multiple agents and complex state spaces. Part II: Knowledge Reasoning focuses on the use of algorithms, such as forward/backward chaining and resolution, to enable reasoning based on a logic-based knowledge base. This separation of knowledge and inference enhances the agent's adaptability to changing conditions. Part III: Machine Learning introduces techniques such as decision trees and neural networks, allowing the agent to operate autonomously. Throughout the course, students engage in

lectures and hands-on exercises to develop their skills in AI, gaining exposure to relevant methods, processes, and techniques for understanding and building AI agents.

3. COURSE GOALS

At the end of the course, students are able to

ID	Description	Program LOs
G1	Apply AI concepts in the right context and interpret AI from different aspects	1.4.1, 2.4.5
G2	Demonstrate simple AI agents using the approaches introduced in the course	1.4.1, 4.1.1, 4.1.2, 4.1.3, 5.1.1, 5.1.2
G3	Manipulate tools and libraries for developing AI agents	1.4.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.2.2, 4.2.3
G4	Promote personal aptitudes of logical thinking and communication	2.1.7, 2.1.9, 2.2.2

4. COURSE OUTCOMES

CO	Description	I/T/U
G1.1	Interpret fundamental AI concepts, and apply them in the right context	T
G1.2	Identify the mission, trends, and future of AI in academic research and real-life applications	I
G2.1	Formulate a given problem from the perspective of a search agent	T
G2.2	Appraise search strategies according to the problem formulation (i.e., the search space landscape, the number of agents, the availability of prior knowledge, etc.)	T
G2.3	Represent a complex world and perform reasoning using logic	T/U
G2.4	Explain the fundamental concepts of machine learning	T
G2.5	Illustrate basic machine learning algorithms (e.g., ID3 decision tree, multi-layer perceptron) on well-prepared datasets	T
G3.1	Develop Python programming skills to set up simple AI agent programs	T/U
G3.2	Manipulate open-source libraries and tools available for AI	T/U
G4.1	Develop practical personal communication skills, both oral and writing	U
G4.2	Develop the personal aptitudes of logical thinking	U

5. TEACHING PLAN

Week	Topic	Course outcomes	Teaching/Learning Activities
1	Introduction to AI Problem solving by Search: Problem Formulation	G1.1-2 G2.1	Lecturing and Discussion
2	Problem solving by Search: Search strategies	G1.1 G2.1-2	Lecturing and Practicing case studies
3	Adversarial search	G1.1 G2.1-2	Lecturing and Practicing case studies H1: Problem solving by search
4	Constraint satisfaction problem	G1.1 G2.1-2	Lecturing and Practicing case studies Q1: Search strategies
5	Logical inference with Propositional logic	G1.1 G2.3	Lecturing and Practicing case studies H2: Adversarial search and CSP
6	**Midterm Examination** Logical inference with First-order logic	G1.1 G2.3	Lecturing and Practicing case studies
7	Logical inference with First-order logic	G1.1 G2.3	Lecturing and Practicing case studies Q2: PL and FOL inference
8	Machine learning: Basic concepts and Recent advances in AI	G1.1-2 G2.4	Lecturing and Discussion H3: Logical and Probabilistic inference
9	Machine learning: ID3 Decision tree	G1.1 G2.4-5	Lecturing and Practicing case studies
10	Machine learning: Multi-layer perceptron	G1.1 G2.4-5	Lecturing and Practicing case studies Q3: Machine learning
11	Review	G1.1-2 G2.4-5	Practicing case studies H4: Machine learning

6. LABORATORY WORK PLAN

The teaching assistants are responsible for

- Consolidating students' comprehension by giving tutorials in office hours (on demand),
- Organizing review sessions for midterm and/or final examinations, and
- Giving, correcting, and grading in-class quizzes, and homework.

The lab instructors are responsible for

- Consolidating students' problem-solving and programming skills on typical AI toy/practical problems, and
- Organizing one Q&A session (or more) for each project announcement, and
- Giving, correcting, and grading lab works and projects.

Students will not have weekly classes for laboratory work. Instead, they will contact TA or lab instructors when necessary.

Week	Topic	Course outcomes	Teaching/Learning Activities
1	Python programming review		Self-study activities
2	Global search and local search strategies	G1.1, G2.1-2 G3.1-2	Self-study activities
3	Adversarial search: Minimax and Alpha-beta pruning	G1.1, G2.1-2 G3.1-2	Self-study activities
4	Constraint satisfaction problem	G1.1, G2.1-2 G3.1-2, G4.1-2	Self-study activities P1: Problem solving by search
5	FC/BC using First-order logic	G1.1, G2.3 G3.1-2	Self-study activities
6	FC/BC using First-order logic	G1.1-2, G2.3 G3.1-2	
7	Recent advances in AI	G1.1-2	
8	ID3 Decision tree	G1.1, G2.4-5 G3.1-2	
9	Multi-layer perceptron	G1.1, G2.4-5 G3.1-2, G4.1-2	P2: Knowledge representation and inference / Machine learning
10	Review		Self-study activities

7. ASSESSMENTS

ID	Topic	Description	Course outcomes	Ratio (%)
A	**Coursework (including but not limited to)**			**50**
A1	**Personal assignments**			**10**
A11	In-class Quizzes (Q1 → Q3)	*30 minutes, closed-book, in-class written assignments.* They are on any topics in any lecture covered and any reading material assigned up to the time the quiz is administered.	G1.1, G2.1-5	10
A2	**Group assignments**			**40**
A21	Projects (P1 → P2)	*3-4 weeks, take-home coding assignments, 4 members per group* Each project includes *a Python program* sufficient for solving practical AI problems and *a written report*.	G1.1-2, G2.1-5, G3.1-2, G4.1-2	30
A22	Homework (H1 → H4)	*2 weeks, take-home assignments, exactly 2 members per group. OPTIONAL.* They are on any fundamental topics in any lecture covered and any advanced topics found in other reading materials.	G1.1-2, G2.1-5, G4.1-2	10
B	**Examinations**			**60**
B1	Midterm exam	*60 minutes, closed-book, in-class written exam.* They are on any topics in any lecture covered and any reading material assigned up to the time the exam is administered	G1.1-2 G2.1-2, G4.1-2	20
B2	Final exam	*90 minutes, closed-book, in-class written exam.* They are on any topics in any lecture covered and any reading material assigned up to the time the exam is administered	G1.1-2, G2.1-5, G4.1-2	40

8. RESOURCES

Textbooks

- Stuart Russell and Peter Norvig. **Artificial Intelligence: A Modern Approach** (4th ed.). Pearson, 2020.
- Lê Hoài Bắc and Tô Hoài Việt. **Giáo trình Cơ sở Trí tuệ nhân tạo**. Khoa Công nghệ Thông tin, Nhà xuất bản Khoa học kỹ thuật, 2014.

Others

- Richard S. Sutton and Andrew G. Barto. **Reinforcement learning: An introduction** (2nd ed.). The MIT Press, 2018.

Tools, libraries, software

- IDE for Python 3 programming
- SWI-Prolog for logic programming
- Weka software and scikit-learn library for machine learning algorithms

9. GENERAL REGULATIONS & POLICIES

- All students are responsible for reading and following strictly the regulations and policies of the school and university.
- Students who are absent for more than three theory sessions are not allowed to take the exams.
- For any kind of cheating and plagiarism, students will be graded 0 for the course. The incident is then submitted to the school and university for further review.
- Students are encouraged to form study groups to discuss the topics. However, individual work must be done and submitted on your own.
- Students who are absent for mid-term exam or final exam and students who have less than 10% project scores are considered unqualified for course completion.