TEACHING GUIDE

1. BASIC INFORMATION

Subject	**Intelligent Systems**
Degrees	**Intelligent Systems Engineering (GISI)**
Faculties	**Faculty of Engineering and Business Technology**
ECTS	**6**
Character	**Mandatory**
Language	**English**
Mode	**In-person/Synchronous In-person**
Semester	**Fifth**
Subject Coordinator	**Yago Fontenla Seco**

2. PRESENTATION

The course Intelligent Systems focuses on building intelligent systems by integrating key AI concepts such as search algorithms, constraint satisfaction, logical reasoning, multi-agent systems, and knowledge-based systems.

3. COMPETENCIES AND LEARNING OUTCOMES

Competencies	Code	Description
Basic Competencies	CB01	Students must demonstrate that they possess and understand knowledge in a field of study based on general secondary education. This knowledge is typically at a level that, while supported by advanced textbooks, also includes some aspects derived from the forefront of their field of study.
	CB02	Students must be able to apply their knowledge to their work or vocation in a professional manner and possess the skills typically demonstrated through the development and defense of arguments and the resolution of problems within their field of study.
General Competencies	CG01	Solve complex and unpredictable situations systematically, creatively, and with critical judgment, making decisions with incomplete information and taking risks within the field of engineering.
	CG02	Effectively determine objectives, priorities, methods, and controls to perform tasks by organizing activities within available deadlines and resources in the field of engineering.
	CG03	Demonstrate the ability to analyze, synthesize, and evaluate data and information in the field of engineering.
Transversal Competencies	CT03	Demonstrate oral and written communication skills in a foreign language.
	CT05	Solve problems and make decisions by applying knowledge, methods, and tools in their academic and professional field.

Competencies	Code	Description
	CT07	Demonstrate skills and attitudes for both autonomous work and teamwork.
	CT08	Use knowledge, skills, abilities, and attitudes to communicate in digital environments.
Specific Competencies	**CE21**	Graduates will be able to use paradigms and techniques from intelligent systems to acquire, formalize, and represent knowledge in a computable form, enabling them to develop computational applications in intelligent environments.

Code	Description
LO01	Understand the theoretical foundations of multi-agent systems, including perception, action, and their applications.
LO02	Learn and apply methodologies for specifying software agents.
LO03	Analyze, design, and define the organization, communication, coordination, collaboration, and planning of a multi-agent system to solve problems.
LO04	Select and use platforms and programming languages for the development of multi-agent systems.
LO05	Understand the foundations and models for distributed problem-solving.
LO06	Identify, acquire, represent, and process knowledge in intelligent software agents.
LO07	Use software tools relevant to the subject matter.
LO08	Prepare a final project applying the course content.

4. CONTENT

Unit I - Introduction to Artificial Intelligence and Intelligent Agents

   1.1. Introduction to AI

   1.2. Intelligent Agents

Unit II - Problem Solving

   2.1 Solving Problems by Search

   2.2 Search in Complex Environments

   2.3 Constraint Satisfaction Problems

Unit III - Multi-Agent Systems

   3.1 Introduction to Multi-Agent Systems

   3.2 Properties of Multiagent Environments

   3.3 Adversarial Search and Game Theory

Unit IV - Knowledge Representation and Reasoning

   4.1 Logical Agents

   4.2 Solving Problems by Reasoning

   4.3 Knowledge Based Systems

5. TEACHING AND LEARNING METHODOLOGIES

UIE develops an innovative academic model centered on the learner, combining different philosophical approaches to Teaching-Learning (T-L), a wide variety of learning activities—especially those in which students take an active role in knowledge construction—continuous guidance, and the intensive use of technology as a facilitating tool, creating a unique and innovative learning ecosystem.

The training is conducted in an in-person modality, including synchronous virtual learning, supported by a cutting-edge virtual campus that provides flexibility and personalization within a ubiquitous learning (U-Learning) model.

Additionally, in alignment with its founding and corporate principles of social responsibility, UIE not only encourages the participation of its entire university community in volunteer and social service activities but also incorporates the Service-Learning (ApS) approach as a formal component of its teaching-learning strategies.

Code	Activity	Type	Teaching Modalities	Mode
MD01	First Contact and Motivation	I	Introductory	PR
MD02	Presentation, Course Plan and Commitment	I		
MD03	Lecture	T	Expository and Participatory	PR
MD05	UIE Methodology	T/P	Guided / Autonomous	PR / NP
MD07	Activity in the Virtual Campus UIE	T/P		
MD08	Content Study	T	Guided / Autonomous	NP
MD09	Project and Assignment Development	T/P		
MD13	Presentation	T/P	Guided / Autonomous	
MD16	Use of Software Tools	P		
MD17	Laboratory Practices	P		
MD20	Tutoring	T/P	Personalized (Individual/Group)	PR
MD21	Learning Agreement	I/T/P		
MD22	Portfolio Assessment	T/P	Autonomous	NP
MD25	Monitoring and Completion	C	Continuous Self-Assessment	NP

I: Informative   **T**: Theoretical   **P**: Practical   **C**: Complementary

PR: In-person   **NP**: Non-in-person

6. TRAINING ACTIVITIES

The following identifies the types of educational activities that will be carried out:

Code	Name	Modality	Type of activity
AF01	Introductory	IP	Motivational/Informative
AF02	Expository and Participatory	IP	Theoretical
AF03	Guided	IP	Theoretical / Practical
AF04	Personalized (Individual / Group)	IP	Theoretical / Practical
AF05	Autonomous	NP	Theoretical / Practical
AF06	Service-Learning	IP	Service-Learning
AF07	Continuous self-assessment	NP	Quality Assessment

IP: In-person   NP: Non-in-person

7. EVALUATION

The model also includes the continuous assessment process as an essential part of verifying the competencies acquired. For UIE, and in line with the proposed improvement of the teaching-learning process for the European Higher Education Area (EHEA), the assessment system, called Learning Outcomes Review (LOR), is developed as a more humanized process, distancing itself from traditional systems where students risk their fate in exams (sessions), sometimes with high and decisive percentage weights, leading to stress, frustration, and occasionally, dropout.

The UIE LOR system is continuous, shared, and progressive, allowing for the monitoring of learning throughout the entire period, making it a natural process to which students turn without negative emotions and aware of the need to understand their own progress.

Code	Evaluation Activity	Weighting %	Type	Mode
AE01	Partial Tests	25	Discrete	W
AE03	Projects	30	Discrete	W
AE04	Presentation	10	Discrete	O
AE05	Participation in the Virtual Campus	10	Discrete	W
AE06	Participation, Daily Activities and Volunteering	5	Discrete (Pass/ Fail)	
AE08	Service-Learning			
AE09	Digital Portfolio	20		DF
AE10	Retake Partials	-		W
		100		

Mode: O: Oral   W: Written   O/E: Both   DF: Digital Folder

8. BIBLIOGRAPHY

➢ Barr, A., Feigenbaum, E. (1981). The Handbook of Artificial Intelligence. Elsevier.

➢ Grosan, C., Abraham, A. (2011). Intelligent Systems: A Modern Approach. Elsevier.

➢ Kacprzyk, J., Pedrycz, W., (2015). Springer Handbook of Computational Intelligence. Springer.

➢ Palma, J.T., Marín, R. (2008). Inteligencia Artificial: técnicas, métodos y aplicaciones. McGraw-Hill.

➢ Reeves, C., Rowe, J. (2003). Genetic Algorithms. Handbook of Metaheuristics. Kluwer Academics.

➢ Russell, S., Norvig, P. (2020). Artificial Intelligence: A Modern Approach (4th Edition). Pearson.

➢ Sancho, F. Curso Inteligencia Artificial. Parte I: IA Clásica. Búsquedas con Adversario e Incertidumbre (http://www.cs.us.es/~fsancho/?e=107)

9. TUTORIALS

MD20 Tutorial (2%): Students must attend at least three personalized tutorials throughout the semester. This is an all-or-nothing activity ("Pass-Fail"), meaning that all three tutorials must be completed.

10. QUALITY SURVEYS

MD25 Quality Management (2%): Students must complete four forms throughout the semester related to UIE's quality management. This is an all-or-nothing activity ("Pass-Fail"), meaning that all four forms must be completed within the deadlines specified in the course activity plan. The activity aims to timely assess the development of the teaching-learning process and the transversal competence related to critical and self-critical thinking.