ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000606 - Intelligent Systems

DEGREE PROGRAMME

10AN - Master Universitario En Ingenieria Informatica

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

Index

Learning guide

1. Description

1.1. Subject details

Name of the subject	103000606 - Intelligent Systems
No of credits	4.5 ECTS
Type	Compulsory
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AN - Master Universitario en Ingenieria Informatica
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Martin Molina Gonzalez (Subject coordinator)	2111	martin.molina@upm.es	Sin horario.
Daniel Manrique Gamo	2109	daniel.manrique@upm.es	Sin horario.
Mariano Rico Almodovar	2110	mariano.rico@upm.es	Sin horario.
M. Carmen Suarez De Figueroa Baonza	2201	mdelcarmen.suarezdefigueroa@upm.es	Sin horario.

Asuncion De Maria Gomez Perez	2209	asuncíondemaria.gomez@upm.es	Sin horario.

* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

3. Skills and learning outcomes *

3.1. Skills to be learned

CB10 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.

CE12 - Capacidad para aplicar métodos matemáticos, estadísticos y de inteligencia artificial para modelar, diseñar y desarrollar aplicaciones, servicios, sistemas inteligentes y sistemas basados en el conocimiento.

3.2. Learning outcomes

RA62 - To be able to identify areas of application where the techniques of intelligent systems can be used.

RA63 - To be able to use and apply methods for knowledge acquisition to create manually and automatically knowledge bases using other sources of information (e.g., data sets or text documents).

RA64 - To be able to use and apply languages and software tools for knowledge representation and reasoning for building knowledge-based arquitectures of intelligent systems.

RA61 - To know the existing techniques about intelligent systems (knowledge acquisition, knowledge representation and reasoning) understanding their scope and limitations.

RA60 - To know what are the main challenges and achievements in the area of intelligent systems

RA65 - To be able to search and manage bibliographic sources to analyse the state of the art in the area of intelligent systems.

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

4. Brief description of the subject and syllabus

4.1. Brief description of the subject

In a broad sense, intelligent systems can be considered as a type of computer system that integrates artificial intelligence algorithms to solve problems in complex environments using limited resources. Intelligent systems are capable of acquiring and using knowledge by integrating methods based on machine learning, knowledge representation and reasoning.

After a general characterization of intelligent systems with an overview of the main approaches and basic concepts, the course presents AI methods that are applicable to the design and construction of intelligent systems. The course describes the foundations of artificial neural networks, which have been used with great success, for example, in problems related to perception or classification. Next, the course presents methods for building ontologies that are useful, for example, for symbolic knowledge representation and knowledge integration. Finally, the course explains natural language processing methods that are useful to facilitate a more effective human-machine interaction.

4.2. Syllabus

1. Unit 1: Introduction to intelligent systems
2. Unit 2: Neural networks
    2.1. Representing neural networks
    2.2. Training neural networks
3. Unit 3: Ontology engineering
    3.1. Ontologies and ontology design patterns
    3.2. How to develop ontologies
4. Unit 4: Natural language processing
    4.1. Corpus creation
    4.2. Classic NLP techniques
    4.3. Neural NLP techniques

5. Schedule

5.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Lecture on Unit 1** Duration: 02:00 Lecture			
2	**Lecture on Unit 1** Duration: 02:00 Lecture			
3	**Lecture on Unit 1** Duration: 02:00 Lecture			
4	**Lecture on Unit 2** Duration: 02:00 Lecture			
5	**Lecture on Unit 2** Duration: 02:00 Lecture			
6	**Lecture on Unit 2** Duration: 02:00 Lecture			
7	**Lecture on Unit 3** Duration: 02:00 Lecture			
8				**Assessment of Unit 2** Written test Continuous assessment Presential Duration: 02:00
9	**Lecture on Unit 3** Duration: 02:00 Lecture			
10	**Lecture on Unit 3** Duration: 02:00 Lecture **Group tutoring session** Duration: 02:00 Additional activities			
11	**Lecture on Unit 4** Duration: 02:00 Lecture			
12	**Lecture on Unit 4** Duration: 02:00 Lecture			

13	**Lecture on Unit 4** Duration: 02:00 Lecture			
14	**Lecture on Unit 4** Duration: 02:00 Lecture **Group tutoring session** Duration: 02:00 Additional activities			
15	**Lecture on Unit 4** Duration: 02:00 Laboratory assignments **Group tutoring session** Duration: 02:00 Additional activities			
16				**Assessment of Unit 4** Written test Continuous assessment Presential Duration: 02:00
17				**Assessment of Unit 2** Written test Final examination Presential Duration: 02:00 **Assessment of Unit 3** Group work Continuous assessment and final examination Not Presential Duration: 00:00 **Assessment of Unit 4** Written test Final examination Presential Duration: 02:00

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
8	Assessment of Unit 2	Written test	Face-to-face	02:00	30%	2 / 10	CB10 CE12
16	Assessment of Unit 4	Written test	Face-to-face	02:00	35%	2 / 10	CB10 CE12
17	Assessment of Unit 3	Group work	No Presential	00:00	35%	2 / 10	CE12 CB10

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Assessment of Unit 2	Written test	Face-to-face	02:00	30%	2 / 10	CE12 CB10
17	Assessment of Unit 3	Group work	No Presential	00:00	35%	2 / 10	CE12 CB10
17	Assessment of Unit 4	Written test	Face-to-face	02:00	35%	2 / 10	CE12 CB10

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Assessment of Unit 2	Written test	Face-to-face	02:00	30%	2 / 10	CE12 CB10
Assessment of Unit 3	Group work	Face-to-face	00:00	35%	2 / 10	CE12 CB10
Assessment of Unit 4	Individual work	Face-to-face	02:00	35%	2 / 10	CE12 CB10

6.2. Assessment criteria

Partial and final grades are on the scale of 0 to 10. To pass the course it is required that the final grade G must be G >= 5.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
UPM Moodle	Web resource	
Biblography	Bibliography	Selected bibliography (papers and text books)

8. Other information

8.1. Other information about the subject

This course is related to the "Sustainable Development Goal 9" (Build resilient infrastructure, promote sustainable industrialization and foster innovation), defined by the United Nations Development Programme (www.undp.org) in terms of innovation and scientific research in information technologies.