ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000606 - Intelligent Systems

DEGREE PROGRAMME

10AN - Master Universitario En Ingenieria Informatica

ACADEMIC YEAR & SEMESTER

2024/25 - 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	2024-25

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Victor Rodriguez Doncel	2110	victor.rodriguez@upm.es	Sin horario.
Asuncion De Maria Gomez Perez	2209	asunciondemaria.gomez@upm.es	Sin horario.
M. Carmen Suarez De Figueroa Baonza	2201	mdelcarmen.suarezdefigueroa@upm.es	Sin horario.
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.

* 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.

CG8 - Comprensión amplia de las técnicas y métodos aplicables en una especialización concreta, así como de sus límites

3.2. Learning outcomes

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).

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

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.

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

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

* 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 an introduction 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. Next, the course explains natural language processing methods that are useful to facilitate a more effective human-machine interaction. Finally, the course presents a chapter related to AI ethics and regulation related to intelligent systems.

4.2. Syllabus

1. Artificial neural networks
    1.1. Connectionist AI
    1.2. Representing artificial neural networks
    1.3. Training artificial neural networks
2. Ontology engineering
    2.1. Knowledge representation
    2.2. Ontologies and ontology design patterns
    2.3. Building ontologies
3. Natural language processing
    3.1. Corpus creation
    3.2. Classic NLP techniques
    3.3. Neural NLP techniques
4. AI ethics and regulation
    4.1. AI ethics
    4.2. AI regulation

5. Schedule

5.1. Subject schedule*

Week	Type 1 activities	Type 2 activities	Distant / On-line	Assessment activities
1	**Course introduction** 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 1** Duration: 02:00 Lecture **Complementary session** Duration: 02:00 Additional activities			
5	**Assessment of Unit 1** Duration: 02:00 Additional activities			**Assessment of Unit 1** Written test Progressive assessment Presential Duration: 02:00
6	**Lecture on Unit 2** Duration: 02:00 Lecture			
7	**Lecture on Unit 2** Duration: 02:00 Lecture			
8	**Lecture on Unit 2** Duration: 02:00 Lecture			
9	**Lecture on Unit 2** Duration: 02:00 Lecture **Complementary session** Duration: 02:00 Additional activities			
10	**Lecture on Unit 3** Duration: 02:00 Lecture			
11	**Lecture on Unit 3** Duration: 02:00 Lecture			

12	**Lecture on Unit 3** Duration: 02:00 Lecture **Complementary session** Duration: 02:00 Additional activities			
13	**Assessment of Unit 3** Duration: 02:00 Additional activities			**Assessment of Unit 3** Written test Progressive assessment Presential Duration: 02:00
14	**Lecture on Unit 4** Duration: 02:00 Lecture			
15	**Lecture on Unit 4** Duration: 02:00 Lecture			
16				**Assessment of Unit 1** Written test Global examination Presential Duration: 02:00 **Assessment of Unit 3** Written test Global examination Presential Duration: 02:00 **Assessment of Unit 2** Group work Progressive assessment and Global Examination Not Presential Duration: 00:00 **Assessment of Unit 4** Written test Progressive assessment and Global Examination Presential Duration: 02:00
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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.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
5	Assessment of Unit 1	Written test	Face-to-face	02:00	30%	2 / 10	CB10 CE12
13	Assessment of Unit 3	Written test	Face-to-face	02:00	30%	2 / 10	CB10 CE12
16	Assessment of Unit 2	Group work	No Presential	00:00	30%	2 / 10	CB10 CE12
16	Assessment of Unit 4	Written test	Face-to-face	02:00	10%	/ 10	CB10 CG8

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
16	Assessment of Unit 1	Written test	Face-to-face	02:00	30%	2 / 10	CB10 CE12
16	Assessment of Unit 3	Written test	Face-to-face	02:00	30%	2 / 10	CB10 CE12
16	Assessment of Unit 2	Group work	No Presential	00:00	30%	2 / 10	CB10 CE12
16	Assessment of Unit 4	Written test	Face-to-face	02:00	10%	/ 10	CB10 CG8

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Assessment of Unit 1	Written test	Face-to-face	02:00	30%	2 / 10	CB10 CE12
Assessment of Unit 2	Group work	Face-to-face	00:00	30%	2 / 10	CB10 CE12

Assessment of Unit 3	Written test	Face-to-face	02:00	30%	2 / 10	CB10 CE12
Assessment of Unit 4	Written test	Face-to-face	02:00	10%	/ 10	CB10 CG8

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.