



## IDENTIFYING DATA

### Intelligent systems

Subject	Intelligent systems			
Code	006G150V01605			
Study programme	(*)Grao en Enxeñaría Informática			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish Galician English			
Department				
Coordinator	González Moreno, Juan Carlos			
Lecturers	García Lourenco, Analía María González Moreno, Juan Carlos			
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General description	This subject is taught in the second semester of the third year. It tries to provide the student with the minimum necessary knowledge about fundamental concepts that allow the resolution of problems in the field of intelligent systems, and an adequate understanding of how to approach the resolution of said problems.			

This subject includes basic competences for the future professional practice of the Technical Engineer / Technical Engineer in Computer Science, if this is developed in the field of Artificial Intelligence, and also instrumental skills for the acquisition of other skills.

In teaching the content, both the Spanish and Galician languages will be used interchangeably. In what respect to English language, it will be used both in audiovisual and written materials used in the subject; and also it will be used as auxiliary language for those Erasmus students who can enroll in the subject and have difficulties to understand both Spanish and Galician languages.

## Competencies

Code	
A2	Students will be able to apply their knowledge and skills in their professional practice or vocation and they will show they have the required expertise through the construction and discussion of arguments and the resolution of problems within the relevant area of study.
A4	Students will be able to present information, ideas, problems and solutions both to specialist and non-specialist audiences.
B3	Ability to design, develop, assess and ensure accessibility, ergonomics, usability and safety of computing systems, services and applications, as well as the information managed by them.
B6	Ability to conceive and develop centralized or distributed computing systems and architectures, integrating hardware, software and networks, according to the knowledge and training acquired.
B8	Knowledge of the essential subjects and technologies that will allow students to learn and develop new methods and technologies, as well as those that will endow them with versatility to adapt to new situations.
B9	Ability to solve problems by taking the initiative, making decisions and acting independently and creatively. Ability to communicate the knowledge contents, skills and abilities of the Computer Science Engineer profession.
C3	Ability to understand and master the essential concepts of discrete mathematics, mathematical logic, algorithmic mathematics and computational complexity, and their application to the resolution of engineering problems.
C7	Ability to design, develop, choose and assess computer applications and systems to guarantee their reliability, safety and quality, according to ethical principles and existing legislation and regulations.
C12	Knowledge and application of basic algorithmic procedures of computer technologies to design solutions to problems, analyzing the appropriacy and complexity of the proposed algorithms.
C13	Knowledge, design and efficient use of the most appropriate data structures and types for the resolution of a problem.
C14	Ability to analyze, design, build and maintain applications in a robust, safe and efficient way, choosing the most appropriate paradigm and programming languages.

C21	Knowledge and application of the fundamental principles and basic techniques of intelligent systems and their practical application.
C26	Ability to assess clients' needs and determine the software requirements to satisfy these needs, reconciling conflicting goals through attempts to reach acceptable compromises within the limits imposed by costs, available times, existing developed systems and organizations themselves.
C28	Ability to identify and analyze problems and design, develop, implement, verify and document software solutions on the basis of sound knowledge of the theories, models and techniques available nowadays.
D4	Analysis, synthesis and evaluation capacity
D6	Ability to abstract: ability to create and use models that reflect real situations
D7	Ability to search, relate and structure information from various sources and to integrate ideas and knowledge.
D8	Ability to work in situations of lack of information and / or under pressure
D9	Ability to quickly integrate and work efficiently in multidisciplinary teams and to collaborate in a multidisciplinary environment
D10	Interpersonal relationship skills.
D11	Critical thinking
D14	Have motivation for quality and continuous improvement

### Learning outcomes

Expected results from this subject	Training and Learning Results			
Know and understand the main characteristics of the problems that give a solution based on Artificial Intelligence techniques	A2 A4	B6 B8 B9	C12 C14 C21 C26 C28	D4 D6 D7 D10 D11
To carry out the activities of problem solving in Artificial Intelligence	A4	B3 B6 B8 B9	C7 C12 C14 C21	D7 D8 D9 D10 D11
Specify and model a problem using methods of knowledge representation	A4	B6 B8 B9	C7 C14 C21 C26 C28	D4 D6 D14
New	A2	B8	C3 C13 C21 C28	D6 D7 D14
To know and use declarative languages for solving problems of Artificial Intelligence	A2 A4	B6 B8 B9	C14 C21 C26 C28	D4 D7 D8 D14
Identify problems and solutions associated with the planning of robots and software agents.	A2 A4	B6 B8 B9	C14 C21 C26 C28	D7 D8 D9 D11
Understand the problems associated with machine learning and techniques most appropriate solution.	A2 A4	B6 B8 B9	C14 C21 C28	D4 D6 D7 D10 D11 D14

### Contents

Topic	
Resolution of problems	Introduction to the Intelligent Systems The Artificial Intelligence (IA) The IA into the Intelligent Systems Bots and virtual assistants
Planning for robots /agents	Intelligent agents Logical Agents Theoretical Planning Planning in the real world
Systems based in the knowledge	Systems based in rules Systems structured

Representation of the Knowledge	Logical Representation of the Uncertainty
Models of reasoning and learning	Types of Learning Probabilistic Reasoning Theory of the decision
Searches and heuristics	Basic searches Optimal searches Heuristic searches

## Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	6	4	10
Flipped Learning	10	20	30
Practices through ICT	18	9	27
Presentation	3	12	15
Objective questions exam	3	12	15
Report of practices, practicum and external practices	1	12	13
Essay	1	9	10
Laboratory practice	3	9	12
Problem and/or exercise solving	4	14	18

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

## Methodologies

	Description
Lecturing	Exposure by the teacher of the basic and introductory contents of the subject. The virtual campus will be used (as far as possible) to provide the content to those students who cannot attend the master classes in person.
Flipped Learning	During a good part of the course, certain topics and questions will be proposed, with audiovisual and supporting reading material, so that the student reflects and seeks solutions that allow them to acquire and practice transversal competences such as: their capacity for analysis, synthesis and evaluation; her critical reasoning ability; their ability to search, relate and structure information from various sources and to integrate ideas and knowledge; or their ability to work in situations of lack of information and / or under pressure. To carry out this methodology, both the virtual Campus and the remote Campus will be used.
Practices through ICT	Presentation and supervision by the teacher of practical problems that complement the theoretical contents seen in the master classes and in the presentations. To carry out this methodology, both the virtual Campus and the remote Campus will be used.
Presentation	Exposure by students of certain subject contents through the creation and display of short videos. These videos will be developed in small groups of between 2 and 4 people; The videos will be accompanied by a memory of no more than 3500 words that will be delivered together with the video and a series of test questions. The memory will be evaluated as a group work, and the tests will be used to assess the degree of knowledge acquisition of all students. To carry out this methodology, both the virtual Campus and the remote Campus will be used.

## Personalized assistance

Methodologies	Description
Lecturing	The teacher will advise the student in solving the problems they find in understanding the content seen and worked on throughout the course. The teacher will use as support, for that, both the remote Campus and the virtual campus as the circumstances require. The tutorials may be carried out by telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement.
Presentation	The teacher will advise the student on the way in which to organize the content chosen for exposure to the rest of the student body. The teacher will use as support, for this, both the remote Campus and the virtual campus as the circumstances require. The tutorials may be carried out by telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement.
Practices through ICT	The teacher will present the proposed practices, supervise them and solve the doubts that arise about the problems that the student must solve in groups of 2-4 people. The teacher will use as support both the remote campus and the virtual campus as circumstances require. The tutorials may be carried out by telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement.
Tests	Description

Report of practices, practicum and external practices	The teacher will advise the student on the way in which they must organize and present the internship report, using the Remote Campus or the Virtual Campus as the circumstances require. The tutorials may be carried out using telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement.
Objective questions exam	The teacher will advise the student on the ideal way to take the exam; for which both the Remote Campus and the Virtual Campus will be helped as circumstances require. The tutorials may be carried out using telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement.
Essay	The teacher will advise the student on the problems they encounter in understanding the content, and in the most appropriate way to organize it; for which both the Remote Campus and the Virtual Campus will be helped as circumstances require. The tutorials may be carried out using telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement.
Laboratory practice	The teacher will advise the student on the way they should organize and develop the practices; for which both the Remote Campus and the Virtual Campus will be helped as circumstances require. The tutorials may be carried out by telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement.

Assessment							
	Description	Qualification	Training and Learning Results				
Presentation	The Presentation Methodology is oriented to work specifically on the "Knowing to be" typology of interpersonal competences.	10	A2	B8	C3	D4	
	This methodology will be evaluated for students attending through test proof, reports / practice reports and Folder / Dossier deliveries.		A4	B9	C21	D7	
			Covers learning outcomes: RA4, RA6 and RA7			C28	D8
Objective questions exam	The objective questions exam allows to evaluate the "Know" typology of professional competences.	10	A2	B8	C3	D4	
	This test allows to evaluate the contents presented through the Master Lesson and Presentation methodologies		B9	C12	D6		
			Covers learning outcomes: RA1, RA2, RA3, RA4, RA5, RA6 and RA7			C13	D11
Report of practices, practicum and external practices	The Practice Report Test is aimed at working on the "Know" typology of professional competences.	15	A2	B8	C7	D4	
	This test will be developed in groups of 2 people and 3-4 people and complements the learning results of the laboratory practices: RA1, RA2, RA3, RA4, RA5, RA6 and RA7		A4	B6	C12	D6	
				B9	C13	D7	
Essay	The Essay is oriented to work simultaneously on the "Know" and Know "to be" typologies of interpersonal competences.	10	A2	B8	C3	D4	
	Covers learning outcomes: RA4, RA6 and RA7		A4	B9	C21	D7	
					C28	D8	
Laboratory practice	The Laboratory Practice Test is oriented to work simultaneously on the "Know-How" and Know-how "being" typologies of professional competences.	35	A2	B3	C3	D4	
	This test will be evaluated with the applications requested for its realization in groups of 2 people and 3-4 people.		B6	C7	D9		
			Covers the learning outcomes: RA1, RA2, RA3, RA4, RA5, RA6 and RA7	B8	C12	D10	
Problem and/or exercise solving	The Problem and/or exercise solving is aimed at working specifically on the "Know-How" typology of professional competences.	20	A2	B3	C3	D4	
	This test will be used in the evaluation of the contents developed in the methodology of Practices in computer rooms through the delivery of individual exercises in which the student will apply the contents of theory in the solution of concrete problems.		A4	B8	C12	D6	
			Covers learning outcomes: RA1, RA2, RA3, RA4, RA5, and RA6	B9	C13	D7	

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## Other comments on the Evaluation

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### EVALUATION CRITERIA FOR ASSISTANTS and NON-ASSISTANTS in 1st and 2nd Edition of Proceedings and END OF CAREER

- "ASSISTANTS" students are understood to be those students who do the tests and deliveries on a regular basis; therefore, students who, due to any situation outside the learning / teaching process of the subject, cannot do so will be considered "NON-ATTENDING".
- In both cases, to pass the subject it will be essential to obtain a qualification higher than 5 out of 10 in the average of the previous tests; as long as the scores of each of said tests are not less than 4.
- In the event that at the end of the course, a student presents an evaluation of less than four, in one or more of one of the previous tests, the qualification he will obtain will be the minimum value between the average of the scores of said tests and four .
- All deliveries of such tests that are not made on time and in the requested manner will be rated 0.

In case of not passing any of the previous tests the students will be able to recover it up to a total of two times in the dates that are stipulated. Each additional delivery will mean a reduction of 20% in the maximum grade that the student can obtain in said test.

The written tests will be retrieved on the official dates approved by the Center Board of the ESEI and are published on the website <http://www.esei.uvigo.es/index.php?id=29>.

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#### Sources of information

##### Basic Bibliography

Stuart Jonathan Russell, Peter Norvig, **Artificial Intelligence: A Modern Approach**, 3ª, Prentice Hall, 2010

Stuart Russell, Peter Norvig., **Inteligencia Artificial. Un enfoque moderno**, 2ª, Pearson Educación, 2004

Rafael H. Bordini, Jomi Fred Hübner, Michael Wooldridge, **Programming Multi-agent systems in Agent-Speak with Jason**, Wiley, 2007

Kowalski, R., **Lógica, programación e inteligencia artificial**, Díaz de Santos, 1986

**jason.sourceforge.net**, 2017

##### Complementary Bibliography

Hopgood, Adrian A., **Intelligent Systems for Engineers and Scientists**, Tercera, CRC Press, 2012

Plamen Angelov, Dimitar P. Filev, Nikola K. Kasabov, **Evolving Intelligent Systems: Methodology and Applications**, Wiley, 2010

Robert J. Schalkoff, **Intelligent Systems: Principles, paradigms and pragmatics**, Jones and Bartlett Publishers, 2010

Nils. J. Nilsson, **Inteligencia Artificial: Una nueva síntesis**, McGraw Hill., 2001

F. Escolano Ruiz et. al., **Inteligencia Artificial. Modelos, técnicas y áreas de aplicación**, Thomson, 2003

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#### Recommendations

##### Subjects that continue the syllabus

Final Year Dissertation/O06G150V01991

##### Subjects that are recommended to be taken simultaneously

Data centres/O06G150V01601

Concurrency and distribution/O06G150V01602

Project management and direction/O06G150V01603

##### Subjects that it is recommended to have taken before

Algorithms and data structures II/O06G150V01302

Databases I/O06G150V01402

Software engineering I/O06G150V01304

Software engineering 2/O06G150V01403

Databases II/O06G150V01501

User Interfaces/O06G150V01503

#### Other comments

It is recommended that students carry a continuous learning rhythm and that they work according to the forecast indicated in this guide, according to the teaching methodology used; In any case, it is recommended that at least the same hours be spent outside the classroom as were spent on the subject in the classroom. In this way, you can achieve continuous and

adequate learning to successfully pass the subject.

It is also highly recommended to make a comprehensive reading prior to the master classes of the documentation provided by the teacher; This recommendation should be compulsory in those contents that are going to be treated following the inverted classroom methodology, because otherwise the student will not be able to adequately monitor these contents.

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## **Contingency plan**

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### **Description**

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=== EXCEPTIONAL MEASURES PLANNED ===

Both for the case of mixed teaching, as well as for non-face-to-face teaching, the evaluation methodologies and criteria will be maintained.

The use of the remote campus and the virtual campus will be increased when the circumstances require it, as a communication mechanism with the student; especially in the case of tutorials, which may be carried out by telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement.

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