IDENTIFYING DATA

Intelligent systems

Subject	Intelligent systems
Code	O06G150V01605
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, Analia María González Moreno, Juan Carlos Rodríguez Martínez, Francisco Javier
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General description	This course is taught in the second half of third grade. Try to provide students with the necessary minimum knowledge about the fundamental concepts of problem solving in the field of intelligent systems, to understand the new way of approaching the resolution of such problems. This course includes basic skills for future professional practice on Computer Science, if this takes place in the field of Artificial Intelligence and also skills that are instrumental in the acquisition of other skills. English will be use on audiovisual and written material. English support as teaching language will be applied to Erasmus students that need it.

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.
A5	Students will acquire the learning skills that are required to pursue further studies with a high degree of independence.
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.
D1	I1: Analysis, synthesis and assessment skills.
D5	I5: Abstraction skills: ability to create and use models that reflect real situations.
D7	I7: Ability to search for, establish links and organize information coming from different sources and to integrate ideas, knowledge and skills.
D8	I8: Problem-resolution skills.
D9	I9: Ability to make decisions.
D10	I10: Ability to present arguments and justify one s decisions and opinions in logical terms.
D11	P1: Ability to act independently.
D12	P2: Ability to work in situations where information is lacking and under pressure.
D13	P3: Ability to quickly fit into a group and to work efficiently in intradisciplinary teams and to cooperate in an interdisciplinary environment.
D15	P5: Interpersonal relations skills.
D16	S1: Critical-thinking skills.
D18	S3: Independent-learning skills.
D19	S4: Ability to adapt to new situations.
D20	S5: Creativity.
D22	S7: Ability to take the initiative and be determined.
D24	S9: Commitment to striving 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	C14 C21 C26 C28	D1 D5 D7 D8 D9 D10 D11 D15 D16 D18 D19 D20
To carry out the activities of problem solving in Artificial Intelligence	A4	B3 B6 B8 B9	C7 C14 C21	D1 D5 D8 D9 D10 D11 D15 D16 D18 D19 D20 D24
Specify and model a problem using methods of knowledge representation	A4	B6 B8 B9	C7 C14 C21 C26 C28	D1 D5 D10 D15 D16
Knowing the logical formalisms and structures needed for the representation of knowledge	A2 A4	B6 B8 B9	C3 C12 C13 C14	D1 D5 D8 D9 D10 D11 D15 D18 D24

To know and use declarative languages for solving problems of Artificial Intelligence	A2 A4 A5	B6 B8 B9	C14 C21 C26 C28	D1 D5 D7 D8 D10 D11 D15 D16 D20
Identify problems and solutions associated with the planning of robots and software agents.	A2 A4 A5	B6 B8 B9	C14 C21 C26 C28	D5 D7 D8 D10 D11 D12 D13 D15 D16 D18 D19 D22 D24
Understand the problems associated with machine learning and techniques most appropriate solution.	A2 A4 A5	B6 B8 B9	C14 C21 C28	D1 D5 D7 D8 D9 D10 D11 D12 D15 D16 D20

Contents

Topic	
Troubleshooting	Introduction to Artificial Intelligence AI systems and problems AI Approaches Applications of AI
Planning for robots / agents	Intelligent agents Logical agents Bots Planning theory Planning in the real world
Knowledge-based Systems	Logics Rule-based Systems Semantic Networks
Knowledge Representation	Logic Uncertainty Structured representations
Searches and heuristic	Basic searches Optimal search Heuristic searches
Models for reasoning	Probabilistic reasoning Decision Theory

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	15	6	21
Computer practices	18	18	36
Presentation	3	18	21
Objective questions exam	3	6	9
Practices report	1.5	10.5	12
Essay	4	5	9
Laboratory practice	8	16	24

| 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
	Description
Lecturing	Presentation by the teacher of the basic contents of the subject supplemented with available multimedia resources.
Computer practices	Presentation and supervisión by part of the professor of practical problems that complement the theoretical contents seen in the master lessons and in the presentations.
Presentation	Exhibition by students of certain basic contents of the subject through the use of multimedia resources available.

Personalized assistance

Methodologies	**Description**
Lecturing	The professor advise students in the solution of the problems found in the comprehension of the contents seen throughout the course
Presentation	The professor advise students on the way to organize the chosen contents for their exposition to the rest of the students
Computer practices	The professor will explain the proposed practices and solve any doubts that may arise about the problems that the student must solve in groups of 2-4 people, as indicated by the teacher

Tests	**Description**
Practices report	The professor advise students in the way in which he / she must organize and present the report
Objective questions exam	The professor advise students in the proper way to take the exam
Essay	The professor advise students on the problems encountered in understanding the content, and the most appropriate way to organize such content
Laboratory practice	The professor advise students in the way in which he / she must apply the theoretical foundations seen in class for the solution of the individual exercises that are requested

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. This methodology will be evaluated for students attending through test proof, reports / practice reports and Folder / Dossier deliveries. Covers learning outcomes: RA4, RA6 and RA7	8	A4		C3 C21	D7 D9 D10 D12 D13 D15 D16 D19 D20 D22 D24
Objective questions exam	The objective questions exam allows to evaluate the "Know" typology of professional competences. This test allows to evaluate the contents presented through the Master Lesson and Presentation methodologies Covers learning outcomes: RA1, RA2, RA3, RA4, RA5, RA6 and RA7	30	A2 A4	B6 B9	C3 C12 C13 C21 C26 C28	D5 D7 D11 D18
Practices report	The Practice Report Test is aimed at working on the "Know" typology of professional competences. 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	12	A2 A4		C21 C26 C28	D1 D7 D8 D9 D10 D13 D15 D16 D22 D24

Essay	The Essay is oriented to work simultaneously on the "Know" and Know "to be" typologies of interpersonal competences. Covers learning outcomes: RA4, RA6 and RA7	12	A4	B8	C3 C12 C13 C21	D1 D7 D12 D13 D16 D20 D22 D24
Laboratory practice	The Laboratory Practice Test is oriented to work simultaneously on the "Know-How" and Know-how "being" typologies of professional competences. This test will be evaluated with the applications requested for its realization in groups of 2 people and 3-4 people. Covers the learning outcomes: RA1, RA2, RA3, RA4, RA5, RA6 and RA7	28	A2 A4 A5	B3 B6 B9	C3 C7 C12 C13 C14 C21 C26 C28	D8 D13 D15 D20
Problem and/or exercise solving	The Problem and/or exercise solving is aimed at working specifically on the "Know-How" typology of professional competences. 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. Covers learning outcomes: RA1, RA2, RA3, RA4, RA5, and RA6	10	A2 A5	B6 B8	C3 C12 C13 C21 C28	D1 D5 D8 D9 D10 D11 D16 D18 D19 D20 D22 D24

Other comments on the Evaluation

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

- It is understood as "ASSISTANT" students those students who perform the tests and previous deliveries on a regular basis.
- To pass the subject it is essential to obtain a score higher than 5 out of 10 in the average of the previous tests, provided that the scores of each of the tests is not less than 4.
- To be able to perform the average of the master session and presentation / exposition tests, it is necessary to achieve a minimum of 4 in those tests and presentations.
- If at the end of the course, a student submits an evaluation of less than four, in one or more of the previous tests, the grade will be calculated as the minimum value between the average of the grades obtained and four.
- Tests and deliveries not made in time and form will be rated with a 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.

Sources of information

Basic Bibliography

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

Stuart Russell, Peter Norving., **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**, Diaz 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: Priciples, 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 keep a steady pace of learning and dedication to work with dedicated weekly course, to achieve lifelong learning. Strongly recommend a comprehensive pre-reading notes before attending the class.