



## IDENTIFYING DATA

### Knowledge Engineering

Subject	Knowledge Engineering			
Code	006M132V03103			
Study programme	Máster Universitario en Ingeniería Informática			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	1st	1st
Teaching language	Spanish English			
Department				
Coordinator	García Lourenco, Analía María			
Lecturers	García Lourenco, Analía María			
E-mail	analía@uvigo.es			
Web	<a href="http://moovi.uvigo.gal">http://moovi.uvigo.gal</a>			
General description	Techniques and formalisms of knowledge representation and reasoning in intelligent systems. Methodologies of acquisition of knowledge. Techniques of automatic learning in intelligent systems. Data mining techniques and methodologies.			

A large part of the course's support materials are in English, including those elaborated by the professor as well as the bibliography and the case studies and datasets analysed. International students may ask the teacher for: a) materials and bibliographical references to follow the subject in English, b) tutoring sessions in English, c) tests and evaluations in English.

## Training and Learning Results

Code	
A1	(CB6) Have and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context
A5	(CB10) That the students possess the skills of learning that allow them continue studying of a way that must greatly be self-directed or autonomous.
B3	Ability to direct, schedule and supervise multidisciplinary teams
B4	Ability for mathematical modeling, calculation and simulation in technology and business engineering centers, particularly in research, development and innovation tasks in all areas related to Computer Engineering
B8	Ability to apply the acquired knowledge and solve problems in new or little-known environments within broader and multidisciplinary contexts, being able to integrate this knowledge
B9	Ability to understand and apply ethical responsibility, legislation and professional ethics of the activity of the profession of Computer Engineer
C12	
D1	Develop an espíritu innovativo and emprendedor
D4	Capacity to communicate knowledge and conclusions to públicos especializados and no especializados, of oral way and written
D5	Capacity of work in team
D6	Skills of relations interpersonales
D7	Capacity of reasoning crítico and creativity
D11	Capacity of learning autónomo
D12	Capacity to resolve problems in new surroundings or little known inside contexts más wide or multidisciplinarios
D13	Capacity to integrate knowledges and enfrentarse to the complexity to formulate trials from an información incomplete

## Expected results from this subject

Expected results from this subject	Training and Learning Results
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RA1: Know the technicians of acquisition and representation of the knowledge.	A1 A5 B8 C12 D7 D11 D12
RA2: Be able to design an intelligent system, selecting the architecture and the mechanisms of representation more felicitous and applying methodologies and technical of the Engineering of the Knowledge.	A1 B8 B9 C12 D1 D7 D12 D13
RA3: Know the technicians of automatic learning, handle the technicians of extraction of knowledge from diverse sources of data.	A5 B4 B8 C12 D7 D11 D12 D13
RA4: Be able to schedule and develop a project of Minería of Data by means of the integration of distinct technical and algorithms.	A1 B3 B8 C12 D4 D5 D6 D13

## Contents

Topic		
1. KNOWLEDGE ACQUISITION AND REPRESENTATION	1.1. Techniques and formalisms of knowledge representation 1.2. Methodologies of knowledge acquisition 1.3. Reasoning in intelligent systems 1.4. Applications in real world	
2. MACHINE LEARNING	2.1. Techniques of knowledge extraction from various data sources 2.2. Tasks and methods of machine learning 2.3. Model interpretation and comparison	
3. IMPLANTATION AND IMPACT OF BUSINESS ANALYTICS PIPELINES	3.1. Analytical needs and business goals 3.2. Implantation of analytical pipelines in the enterprise 3.3. New challenges of Knowledge Engineering	

## Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	20.5	0	20.5
Case studies	8.5	17.8	26.3
Project	7	68	75
Essay	9	12	21
Presentation	3	2	5

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

## Methodologies

	Description
Lecturing	To present fundamental concepts and to carry out group activities, promoting active student participation, that allow to apply the exposed concepts in practical problem solving. The goal is to promote knowledge acquisition and the ability/sensibility to apply the concepts and techniques to Computer Science industrial and research application domains. CONTINUOUS EVALUATION Mandatory character Facultative attendance GLOBAL EVALUATION Mandatory character

Case studies	Practical activities, sessions of laboratory guided, seminars of resolution of problems, etc., under the direction of the professor. Previous activities may be integrated to achieve the proposed aims. These activities aim to consolidate the acquisition of knowledge and develop the capacity to solve problems in new real-world contexts.
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#### CONTINUOUS EVALUATION

Mandatory character

Mandatory attendance (min. 75% of lab practices)

#### GLOBAL EVALUATION

Mandatory character

### Personalized assistance

#### Methodologies Description

Case studies	Resolution of any issues arising during the analysis of the case studies.
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#### Tests Description

Project	Resolution of any issues arising during the planning and development of the final project.
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Essay	Resolution of any issues arising during essay preparation.
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### Assessment

Description		Qualification	Training and Learning Results			
Project	Development of a project in which the capacity for autonomous work and the critical spirit of the students and their ability to apply the acquired knowledge to real environments are valued. At the end, the students must submit a detailed report of the project. Learning results evaluated: RA2, RA4	40	A1	B3 B8 B9	C12	D1 D4 D5 D6 D12 D13
Essay	Elaboration of essays to promote autonomous learning. The student must submit a detailed report of each of the works carried out throughout the course on the dates previously stipulated. Learning results evaluated: RA1, RA3	30	A1 A5	B4 B8 B9	C12	D4 D7 D11 D12 D13
Presentation	Defense of the solution proposed by the student before the teacher and the rest of the students. Learning results evaluated: RA3, RA4	30	A1 A5	B4 B8	C12	D1 D4 D7

### Other comments on the Evaluation

#### CONTINUOUS EVALUATION SYSTEM

##### TEST 1: Essay

**Description:** Elaboration of essays to promote autonomous learning. The student must submit a detailed report of each of the works carried out throughout the course on the dates previously stipulated.

**Methodology(s) applied(s):** Work.

**% Qualification:** 30%.

**Minimum %:** For passing this part of the subject, the student must obtain a grade equal to or greater than 5 points (out of 10).

**Training:** A1,A5,B4,B8,B9,C12,D4,D7,D11,D12,D13.

**Learning results:** RA1, RA4

##### TEST 2: Presentation

**Description:** Defense of the solution proposed by the student before the teacher and the rest of the students.

**Methodology(s) applied(s):** Presentation.

**% Qualification:** 30%.

**Minimum %:** For passing this part of the subject, the student must obtain a grade equal to or greater than 5 points (out of 10).

10).

**Training:** A1,A5,B4,B8,C12,D1,D4,D7

**Learning results:** RA3, RA4

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### **TEST 3:** Project

**Description:** Development of a project in which the capacity for autonomous work and the critical spirit of the students and their ability to apply the acquired knowledge to real environments are valued. At the end, the students must submit a detailed report of the project.

**Methodology(s) applied:** Project.

**% Qualification:** 40%

**Minimum %:** For passing this part of the subject the student must obtain a grade equal to or greater than 5 points (out of 10)).

**Training:** A1,B3,B8,B9,C12,D1,D4,D5,D6,D12,D13.

**Learning results:** RA2, RA4

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## **GLOBAL EVALUATION SYSTEM**

**Procedure for choosing the global assessment modality:** the student body is considered to have opted for the global assessment system if they do not take Test 1 of the continuous evaluation system.

### **TEST 1:** Essay

**Description:** Elaboration of essays to promote autonomous learning. The student must submit a detailed report of each of the works carried out throughout the course on the dates previously stipulated.

**Methodology(s) applied(s):** Work.

**% Qualification:** 30%.

**Minimum %:** For passing this part of the subject, the student must obtain a grade equal to or greater than 5 points (out of 10).

**Training:** A1,A5,B4,B8,B9,C12,D4,D7,D11,D12,D13.

**Learning results:** RA1, RA4

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### **TEST 2:** Presentation

**Description:** Defense of the solution proposed by the student before the teacher and the rest of the students.

**Methodology(s) applied(s):** Presentation.

**% Qualification:** 30%.

**Minimum %:** For passing this part of the subject, the student must obtain a grade equal to or greater than 5 points (out of 10).

**Training:** A1,A5,B4,B8,C12,D1,D4,D7

**Learning results:** RA3, RA4

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### **TEST 3:** Project

**Description:** Development of a project in which the capacity for autonomous work and the critical spirit of the students and their ability to apply the acquired knowledge to real environments are valued. At the end, the students must submit a detailed report of the project.

**Methodology(s) applied:** Project.

**% Qualification:** 40%

**Minimum %:** For passing this part of the subject the student must obtain a grade equal to or greater than 5 points (out of 10)).

**Training:** A1,B3,B8,B9,C12,D1,D4,D5,D6,D12,D13.

**Learning results:** RA2, RA4

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## EVALUATION CRITERIA FOR EXTRAORDINARY CALL AND FINAL DEGREE

The continuous and global evaluation systems described above will be used.

## RECORD QUALIFICATION PROCESS

Regardless of the evaluation system and the call, if any part of the evaluation is not passed, but the overall score is greater than 4 (out of 10), the qualification in the minutes will be 4.

## EVALUATION DATES

The dates of the tests corresponding to the continuous assessment system will be published in the calendar of activities, available on the ESEI website <https://esei.uvigo.es/docencia/horarios/>. The official exam dates of the different calls, officially approved by the Xunta de Centro of the ESEI, are published on the ESEI website <https://esei.uvigo.es/docencia/exames/>.

## USE OF MOBILE DEVICES

All students are reminded of the prohibition of the use of mobile devices in exercises and practices, in compliance with article 13.2.d) of the University Student Statute, regarding the duties of university students, which establishes the duty to "Refrain from using or cooperation in fraudulent procedures in the evaluation tests, in the works that are carried out or in official documents of the university."

## CONSULTATION/TUTORING REQUESTS

Tutoring hours are available at the personal page of the teaching staff, accessible through <https://esei.uvigo.es/docencia/profesorado/>

## OTHER CONSIDERATIONS

If plagiarism is detected in any of the works (theoretical or practical), the final grade of the course will be Suspenso (0) and the fact will be communicated to the Center Management so that it can take the appropriate measures. In the event of any contradiction that may arise between the different versions of the guide, due to some translation error, the version that will prevail is the Spanish version.

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## Sources of information

### Basic Bibliography

Ian H. Witten, Eibe Frank, Mark A. Hall, **Data Mining: practical machine learning tools and techniques**, 0123748569, 3ª, Morgan Kaufmann, 2011

Aurélien Géron, **Hands-On Machine Learning with Scikit-Learn, Keras, and Tensorflow: Concepts, Tools, and Techniques to Build Intelligent Systems**, 1492032646, O'Reilly Media, 2019

Emmanuel Ameisen, **Building Machine Learning Powered Applications: Going from Idea to Product**, 149204511X, O'Reilly Media, 2020

### Complementary Bibliography

Mathew North, **Data Mining for the Masses**, 1727102479, 3ª, Global Text Project Book, 2018

Jiawei Han, Micheline Kamber, **Data Mining: concepts and techniques**, 9780123814791, 3ª, Morgan Kaufmann, 2011

Jason Bell, **Machine Learning: Hands-On for Developers and Technical Professionals**, 1118889061, 1ª, Wiley, 2015

Travis Booth, **Deep learning with Python : a hands-on guide for beginners**, 1070494070, Independently published, 2019

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## Recommendations

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## Other comments

The student should demonstrate good aptitudes for research.

The student should show some degree of autonomy, i.e. look for contents in the Internet (in general search engines like Google or more specialised engines like CiteSeer), explore the literature and contents related with the presented contents, and have a critical opinion on the topics discussed throughout the course.

Good English understanding is desirable.

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