



## IDENTIFYING DATA

### Intelligent systems programming

Subject	Intelligent systems programming			
Code	V05G300V01943			
Study programme	Degree in Telecommunications Technologies Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	English			
Department				
Coordinator	Burguillo Rial, Juan Carlos			
Lecturers	Burguillo Rial, Juan Carlos Costa Montenegro, Enrique			
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Web				

**General description** This course will begin providing the notion of agent, to comprise what is, how build it and how can, the agents interact for modeling and solving complex problems. Later we will study the design, implementation and application of intelligent agents and multiagent systems in current communications technologies and relate them with other current paradigms such as: object oriented programming, mobile agents, the management distributed of networks, the adaptive user interfaces and the electronic commerce.

The students will learn to program multiagent systems in suitable platforms and mobile terminals (Android). Besides, they will perform a work in group, where they will extend the concepts studied in the subject to other topics of their own interest.

This subject will be taught and evaluated in English, but students have the possibility to interact in Spanish with the teachers at the classroom or at the lab. The documentation of the subject will be provided in English.

## Competencies

Code			
B3	CG3: The knowledge of basic subjects and technologies that enables the student to learn new methods and technologies, as well as to give him great versatility to confront and adapt to new situations		
B4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.		
B9	CG9: The ability to work in multidisciplinary groups in a Multilanguage environment and to communicate, in writing and orally, knowledge, procedures, results and ideas related with Telecommunications and Electronics.		
C86	(CE86/OP29) The ability to program computer applications and services based on artificial intelligence.		
D2	CT2 Understanding Engineering within a framework of sustainable development.		
D3	CT3 Awareness of the need for long-life training and continuous quality improvement, showing a flexible, open and ethical attitude toward different opinions and situations, particularly on non-discrimination based on sex, race or religion, as well as respect for fundamental rights, accessibility, etc.		
D4	CT4 Encourage cooperative work, and skills like communication, organization, planning and acceptance of responsibility in a multilingual and multidisciplinary work environment, which promotes education for equality, peace and respect for fundamental rights.		

## Learning outcomes

Expected results from this subject	Training and Learning Results	
To understand the basic concepts of intelligent systems: search, reasoning and learning.	B3	D2
	B4	D3
	B9	D4

To know the main concepts related with intelligent agents and multiagent systems.	B3	C86	D2 D3
To understand the basic concepts of software engineering in intelligent systems.	B3	C86	
To achieve a suitable level of expertise in the use of IDEs for programming intelligent systems.		C86	D2
To acquire skills in the design and development of intelligent services applied to electronic devices.		C86	D2 D3 D4
To acquire skills for the application of intelligent systems in complex telematic services.		C86	D2 D3 D4

## Contents

Topic	
Introduction to intelligent systems	a) Searching b) Reasoning c) Learning
Intelligent agents	a) Definition of intelligent agent b) Architectures for intelligent agents c) Learning and adaptability
Multiagent systems	a) Distributed Artificial Intelligence and multiagent systems b) Communication between agents: KQML, FIPA-ACL c) Coordination and protocols of interaction d) Learning in multiagent systems e) Self-organised multiagent-systems
Software engineering of oriented to agents	a) Programming and methodologies oriented to agents b) Agents vs. Objects c) Agents vs. Expert Systems d) The JADE development platform
Multiagent systems and Game Theory	a) Cooperation vs. Competition b) Negotiation c) Auctions d) electronic Commerce
Mobile agents	a) Concept of mobile agent b) Security problems c) Possible applications

## Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	3	6	9
Master Session	9	36	45
Laboratory practises	14	28	42
Proceedings	9	0	9
Forum Index	0	4	4
Tutored works	6	30	36
Multiple choice tests	1	4	5

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

## Methodologies

	Description
Introductory activities	We start doing a generic introduction to the aims, and the global contents of the subject together with the results expected at the end of the course.
Master Session	We describe the different topics of the subject providing the necessary educational material.
Laboratory practises	Through this methodology the competencies CG3, CG4, CT2, CT3 and CT4 are developed. Every student must do a practical task in the laboratory with the JADE development platform.
Proceedings	Through this methodology the competencies CG3, CG4, CG9, CE86, CT2 and CT3 are developed. In the classes there will be open discussion, among groups of students, in order to focus on a topic of subject content, the analysis of a case, the outcome of a project, exercise or problem previously developed a keynote address.  Through this methodology the competencies CG3, CG4, CG9, CE86, CT2, CT3 and CT4 are developed.

Forum Index	The students must perform some activities within the TEMA platform at FAITIC in order to discuss topics related to the subject.
	Through this methodology the competencies CG3, CE86, CT2, CT3 and CT4 are developed.
Tutored works	The students must perform a project in group, with the support of the professor, to extend and personalize the topics seen along the theoretical and practical classes.
	At the same time, we will try that the students perform such project demos using Android terminals.
	Through this methodology the competencies CG3, CG4, CG9, CE86, CT2, CT3 and CT4 are developed.

### Personalized attention

Methodologies	Description
Tutored works	In the practical formative activities and tutoring, the professors of the subject will offer personal guidance to each student in the tasks to be performed, with the aim to orient the approach and the methodology. Also they will offer coordination information with other contents and subjects of the study program. It is recommended to consult the doubts with the teachers along the course in order to improve the understanding of the basic concepts, and for performing the tasks and activities to be evaluated.
Laboratory practises	In the practical formative activities and tutoring, the professors of the subject will offer personal guidance to each student in the tasks to be performed, with the aim to orient the approach and the methodology. Also they will offer coordination information with other contents and subjects of the study program. It is recommended to consult the doubts with the teachers along the course in order to improve the understanding of the basic concepts, and for performing the tasks and activities to be evaluated.
Proceedings	In the practical formative activities and tutoring, the professors of the subject will offer personal guidance to each student in the tasks to be performed, with the aim to orient the approach and the methodology. Also they will offer coordination information with other contents and subjects of the study program. It is recommended to consult the doubts with the teachers along the course in order to improve the understanding of the basic concepts, and for performing the tasks and activities to be evaluated.
Forum Index	In the practical formative activities and tutoring, the professors of the subject will offer personal guidance to each student in the tasks to be performed, with the aim to orient the approach and the methodology. Also they will offer coordination information with other contents and subjects of the study program. It is recommended to consult the doubts with the teachers along the course in order to improve the understanding of the basic concepts, and for performing the tasks and activities to be evaluated.

### Assessment

	Description	Qualification	Training and Learning Results		
Laboratory practises	The students will perform a practical task in the laboratory with the JADE development platform where they will work with the concepts studied in the theoretical classes.	35	B3 B4 B9	C86	D2 D3
Proceedings	Discussions done along classes related with expositions done or read previously.	5	B3 B4 B9	C86	D2 D3 D4
Forum Index	Short answers and interaction done individually by students within the TEMA platform to discuss topics related with the subject.	5	B3	C86	D2 D3 D4
Tutored works	Evaluation of the works developed: understanding, maturity, importance and originality of the work and interaction between the group.	25	B3 B4 B9	C86	D2 D3 D4
Multiple choice tests	Three successive tests (weeks 4, 7 and 10) to evaluate the contents given up to that time in the course. The tests will be individual and with time limit.	30	B3 B4	C86	

### Other comments on the Evaluation

The elements that are part of the evaluation of the subject are the following:

- **Questionnaires:** along the course the student will fill 3 questionnaires that will contribute 10% to the final mark (each one).

- **Laboratory practice:** each student will have to perform a practical task in the laboratory that will contribute 35% to the final mark.

- **Group tutored work:** each student will have to do a work in group, about one among several possible topics, that will contribute 25% (20% work done + 5% presentation) to the final mark shared by all group members. Nevertheless, the teachers will follow the work done by every group member, and they will also perform a peer review of the work done. In the case that a student would perform clearly lower than his/her mates, he/she will be rated individually (see note\*).

- **Class participation:** students will discuss in class about expositions done by the professor, and this contributes up to a 5% to the final mark.

- **Forum participation:** students should interact individually in the forum of the subject to achieve up to a 5% to the final mark. To achieve such percentage the student should provide at least two relevant contributions.

Therefore, we have: Final Mark = Questionnaires ( $3 \times 10\% = 30\%$ ) + Lab. practice (35%) + Tutored work (25%) + Class participation (5%) + Forum (5%) = 100%.

The students need to pass the questionnaires, the practical task and the tutored work with at least 4 points over 10 to calculate the average final mark. If any of the marks is below 4, then the final mark will never be higher than 4 points over 10.

Following the degree guidelines, the students that will follow this subject can choose between two possibilities: continuous evaluation and evaluation at the end of the semester.

**Continuous evaluation:** the student follows the continuous evaluation since the moment he/she fulfills two questionnaires. From that moment we assume that he/she will participate in the subject, independently of the assistance to the final exam.

**Evaluation at the end of the semester:** the student will have to perform a final exam that substitutes the questionnaires done along the course, in addition to providing the practical task and the equivalent work to be done as part of the continuous evaluation.

**Evaluation at the end of the second semester:** the student will have to perform the part that has not passed previously.

This subject will be evaluated in English, but students have the possibility to interact in Spanish with the teachers at any time.

**The questionnaires and tasks, proposed and performed along the module, are only valid for the current course.**

#### **\*NOTE: Multidisciplinary Group Tutored Work (optional)**

This course 2017/18, and as an innovation project, some students will have the possibility to join a multidisciplinary group (MDG) with other three subjects: (1) Video Games: design and development, 4th year, Degree in Audiovisual Communication. (2) Multimedia Technology and Computer graphics, 4th year, Degree in Telecommunication Engineering Technologies, Sound and Image module. (3) Intelligent systems programming, 4th year, Degree in Telecommunication Engineering Technologies, Telematics module. The activity is coordinated by teachers of the Teaching Innovation Group: ComTecArt (Communication, Technology and Art in Virtual Environments).

The activities and tasks to be performed by the students of this subject in the MDG will be related with using artificial intelligent techniques in videogames. The students that would join this multidisciplinary tutored work will not participate in the ordinary groups C. Besides, each MDG will only join one student from this subject, so he/she will be rated individually in such case.

The participation in the MDG is optional, and if there are more request than available positions; then those students will be ranked and selected according to the global grade mark, provided by the Escola de Enxeñaría de Telecomunicación Secretary.

There will be group work sessions on Wednesday mornings, alternating between the Campus of Vigo and Pontevedra. The University will provide free round trip transportation from the Escola de Enxeñaría de Telecomunicación or the Facultad de Ciencias Sociais e a Comunicación, respectively.

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#### **Sources of information**

##### **Basic Bibliography**

Michael Wooldridge,, **An Introduction to Multiagent Systems**, Addison-Wesley, 2a,

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**Complementary Bibliography**

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

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Jacques Ferber, **Multi-Agent Systems: an Introduction to Distributed Artificial Intelligence**, Addison-Wesley, 1a,

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Alison Cawsey, **The Essence of Artificial Intelligence**, Prentice Hall Europe, 1a,

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**Recommendations**

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

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Programming II/V05G300V01302

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**Other comments**

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The only requirement for the students, in order to follow this subject, is to have a basic understanding of Java programming.

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