Bachelor in Computer Science Engineering

Course information

Year 2021-22

GENERAL SPECIFICATIONS				
English name				
Intelligent Systems				
Spanish name				
Sistemas Inteligentes				
Code		**Type**		
606010234		Mandatory		
Time distribution				
	Total	**In class**	**Out class**	
Working hours	150	60	90	
ECTS: 6				
Standard group	**Small groups**			
	Classroom	**Lab**	**Practices**	**Computer classroom**
3				3
Departments		**Knowledge areas**		
Information Technology		Computer Science and Artificial Intelligence		
Year		**Semester**		
3º		2º		

TEACHING STAFF			
Name	**E-Mail**	**Telephone**	**Office**
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SPECIFIC INFORMATION OF THE COURSE
1. Contents description
1.1. In English:
Lesson 1: Introduction. Search in AI Lesson 2: Intelligent Agents Lesson 3: JADE Lesson 4: Classic Planning Lesson 5: Constraint Programming Lesson 6: Multiagent Systems Lesson 7: Implicit Coordination Lesson 8: Explicit Coordination Lesson 9: Conceptualization: Acquisition of Concepts Lesson 10: Ontologies and taxonomies
1.2. In Spanish
Tema 1: Introducción: Búsquedas en IA Tema 2: Agentes Inteligentes Tema 3: Agentes JADE

Tema 4: Planificación Clásica
Tema 5: Programación de Restricciones
Tema 6: Sistemas Multiagentes
Tema 7: Coordinación Implícita
Tema 8: Coordinación Explícita
Tema 9: Conceptualización: Aprendizaje de Conceptos
Tema 10: Ontologías y taxonomías

2. Background

2.1.Situation within the Degree:

Subject that delves into the concepts acquired in previous subjects, such as Artificial Intelligence, and which are important for the intelligent resolution of problems. These concepts encompass planning, constraint satisfaction and knowledge interoperability, important for later subjects and for practical applications of AI in industry

2.2. Recommendations:

The student should have knowledge of object-oriented programming, especially Java, and basic search techniques for Artificial Intelligence.

3. Objectives (as result of teaching):

- Knowledge of more advanced techniques of Artificial Intelligence.
- Approach to problems increasingly closer to reality

4. Skills to be acquired

4.1. Specific Skills:

CE3-C: Ability to evaluate the computational complexity of a problem, know algorithmic strategies that can lead to its resolution and recommend, develop and implement the one that guarantees the best performance in accordance with the established requirements.
CE4-C: Ability to know the foundations, paradigms and techniques of smart systems and analyze, design and build computer systems, services and applications that use these techniques in any field of application
CE5-C: Ability to acquire, obtain, formalize and represent human knowledge in a computable way for solving problems through a computer system in any field of application, particularly those related to aspects of computing, perception and performance in environments or smart environments.
CE7-C: Ability to know and develop computational learning techniques and design and implement applications and systems that use them, including those dedicated to automatic extraction of information and knowledge from large volumes of data

4.2. General Skills:

CB5: That students have developed those learning skills necessary to undertake studies later with a high degree of autonomy
CG0: Capacity for analysis and synthesis: Find, analyze, criticize (critical reasoning), relate, structure and synthesize information from various sources, as well as integrate ideas and knowledge.
G02: Oral and written communication skills in the academic and professional fields, with special emphasis on writing technical documentation
G03: Ability to solve problems
G04: Ability to make decisions based on objective criteria (experimental, scientific or simulation data available) as well as the ability to argue and logically justify these decisions, knowing how to accept other points of view

G05: Capacity for teamwork.
G06: Capacity for autonomous learning as well as initiative and entrepreneurial spirit
CT1: Correctly master the Spanish language, the various styles and the specific languages necessary for the development and communication of knowledge in the scientific and academic field.
CT2: Development of a critical attitude in relation to the capacity for analysis and synthesis.
CT4: Ability to use the Computer and Informational Competences (CI2) in professional practice.

5. Training Activities and Teaching Methods

5.1. Training Activities:

- Theory sessions on the contents of the Program.
- Problem Solving Sessions.
- Practical Sessions in Specialized Laboratories or Computer Rooms.
- Field sessions to approach Industrial reality.
- Academically Directed Activities by Teachers: seminars, conferences, work development, debates, collective tutoring, evaluation and self-evaluation activities.

5.2. Teaching Methods:

- Participatory Master Class.
- Development of Practices in Specialized Laboratories or Computer Rooms in small groups.
- Problem Solving and Practical Exercises.
- Approach, Realization, Tutoring and Presentation of Works.
- Evaluations and Exams.

5.3. Development and Justification:

Theory academic sessions
The theoretical classes will last 2 hours. They will be exposed and explained, with the help of the projections and / or the whiteboard the contents associated with each topic. Specific bibliography for each topic will be available at the subject website in advance.

Academic problem sessions
At the end of the theory sessions for each topic, the problem sessions corresponding to the topic will be developed developed. A problem bulletin will be provided for each theory topic. In these sessions the problems will be solved most representative of each newsletter.

Laboratory practice sessions
The practical sessions will take place in classrooms equipped with computers and will last 2 hours. In these Practices will explain implementation aspects of the different phases of a compiler. The code to explain in each One of the sessions will be available on the subject's website sufficiently in advance. These sessions will use Java as a programming language, Eclipse as a development environment.

Resolution and delivery of problems / practices
Throughout the course a practical work will be proposed to be developed by the students individually. The work is will refer to the development of a language processor without the aid of automatic tools, as explained in the first practice block. This work is considered a directed academic activity and its explanation will be done in the practice sessions schedule. The monitoring of this work will be done in individualized tutorials.

As a general rule, the attendance regime for the theoretical and practical classes is optional, in no case is a minimum number of hours of attendance to pass the subject. Attendance will only be compulsory classroom assessment activities

6. Detailed Contents:

Topic 1: Introduction: AI searches

- Review of the concepts necessary to approach the subject and that have already been acquired in previous courses

Topic 2: Smart Agents

- Introduction to the agent-based programming paradigm.
- Definition of agent, types, architectures, etc.
- Agents classification. Behaviors.
- Types of behaviors.
- Smart communication.

Topic 3: JADE Agents and NetLogo

- JADE architecture. FIPA standard.
- Platform architecture overview
- Description of the basic concepts for the construction of an SMA JADE. Lifecycle.
- Simple and compound behaviors.
- JADE communication.
- Platform FIPA services
- Introduction to the NetLogo platform

Topic 4: Classical Planning

- Description of the planning problem (single agent).
- Planning as a search problem.
- STRIPS methodology and algorithm.
- Sussman anomaly.
- Partial Order Planning.
- PDDL.
- Other planners.

Topic 5: Programming with Restrictions

- Definition of the problem
- Constraint-based modeling
- Problem reduction: Consistency
- Heuristic search algorithms

Topic 6: Behavior Design

- State machine
- Behavior Trees
- Complex behaviors

Topic 7: Multiagent Systems

- Introduction to the concept of SMA.
- Collective behaviors.

- Joint resolution of tasks. Homework distributions.
- Hierarchies and social organizations.
- Cooperation -vs- Competition
- Communication as a means of coordination.

Topic 8: Implicit Coordination
- Environment Agent.
- Communication through the environment.
- Emerging behaviors.
- Biological systems: Ant colonies.

Topic 9: Explicit Coordination
- The communicative act.
- Coordination through communication.
- Communication languages.
- Communication protocols.
- Negotiation: ContractNet.

Topic 10: Conceptualization: Concept Learning
- Data, Information and Knowledge.
- Conversion of data into knowledge.
- Conceptual learning: Formal Analysis of Concepts.
- Contexts, Concepts, Reticles and Rule Sets.
- Rule-based reasoning systems.

Topic 11: Ontologies and taxonomies
- Structuring the data.
- Information hierarchy: taxonomies.
- Information extension: Properties and roles.
- Ontologies. Methodology for the construction of ontologies.
- Tools for editing ontologies.
- Ontology-based reasoning: Consistency.
- SPARQL query language.

7. Bibliography

7.1. Basic Bibliography

- Jacques Ferber; Multi-Agent Systems, An Introduction to Distributed Artificial Intelligence.; Addison Wesley Longman. 1999

- Gerhard Weiss (ed.); Multiagent systems; The MIT Press, 1999

- M. Klusch (Ed.); Intelligent Information Agents. Agent-Based Information Discovery and Management; Springer Verlag, 1999

7.2. Additional Bibliography:

- Artificial Intelligence: A Modern Approach. Stuart J. Russell, Peter Norvig. Prentice Hall. ISBN 10: 0131038052 ISBN 13: 9780131038059

8. Systems and Assessment Criteria

8.1. System for Assessment:

- Examen de teoría/problemas
- Defensa de Prácticas
- Examen de práctica

8.2. Assessment Criteria and Marks:

- Theory / Problems Exam: 60%
- Practice Defense: 40%
- Defense of Works and Written Reports: 0%

The activities corresponding to the evaluation system "Theory / Problems Exam" will be carried out / presented on the dates established by the center for official calls. These activities will be: i) theory test with a weight of 30% ii) problem test with a weight of 30%.
The activities corresponding to the evaluation system "Defense of practices" will be carried out on the dates published, sufficiently in advance, by the teaching team.
The final grade of the course for an ordinary call will be obtained by making the weighted average by the percentages of the partial grades obtained in each of the evaluation systems of the current call, as long as it exceeds 40% in all evaluable activities of each of the evaluation systems.

Those students who consider it so can choose to take a single final evaluation. In this case, the evaluation will consist of an evaluation test with the following blocks:
* Theory block (60%): Examination of questions (theoretical and / or problems), face-to-face and individual, with a maximum duration of 2 hours. The subject matter of the exam will be the whole one treated throughout the course. You can only use the documentation provided by the teaching team on the day of the test (if there is any). This exam will be made up of two activities: i) theory test with a weighting of 30% ii) problem test with a weighting of 30%.
* Practice block (40%): Exam in which an eminently practical statement to be developed will be presented, they have a face-to-face and individual character and last 2 hours. Only the documentation provided by the teaching team can be used on the day of the test.

The mention of Honor Registration may be awarded to students who have obtained a grade equal to or greater than 9.5. As a general rule, these mentions will be awarded in descending order to the final grade obtained and in order of calls.
In no case will the number of "Honor Registrations" awarded be greater than the maximum established for the subject in the current academic year. In the event of a tie, the regularity obtained throughout all the proposed evaluation systems will prevail.

For all the materials delivered by the students, the declaration of originality of the same is implicitly assumed, understood in the sense that it has not used sources without citing them properly. The detection of plagiarism in any of these materials, and in application of article 15 of the Evaluation Regulation for the undergraduate and official master's degrees of the University of Huelva, will entail a numerical grade of zero (0) in the subject, independently of the rest. of grades that the student would have obtained. In addition, the professor will initiate the appropriate disciplinary procedure before the Department's Teaching Commission