UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: INTELLIGENT SYSTEMS
Code: 42321
Type: CORE COURSE
ECTS credits: 6
Degree: 346 - DEGREE IN COMPUTER SCIENCE AND ENGINEERING
Academic year: 2019-20
Center: 604 - SCHOOL OF COMPUTER SCIENCE AND ENGINEERING (AB)
Group(s): 10 11 12
Year: 3
Duration: First semester
Main language: Spanish
Second language: English
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: Y

Lecturer: **MARIA JULIA FLORES GALLEGO** - Group(s): **12**

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Lecturer: **LUIS DE LA OSSA JIMENEZ** - Group(s): **12**

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ESII / 0.A.12	SISTEMAS INFORMÁTICOS	2413	luis.delaossa@uclm.es	Consultar https://www.esiiab.uclm.es/tutorias.php

Lecturer: **JOSE MIGUEL PUERTA CALLEJON** - Group(s): **10 11**

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ESII / 1.C.14	SISTEMAS INFORMÁTICOS	926053248	jose.puerta@uclm.es	En el enlace: http://esiiab.uclm.es/pers.php?codpers=81&curso=2019-2020

2. Pre-Requisites

This subject requires capability for working with abstract concepts, and some skills for autonomous problem solving.

In relation to previous subjects in the degree, it requires:

- Basic knowledge of discrete maths and probabilities.
- Capability for stating and solving problems through logic (first order-logic, inference, resolution, etc.)
- Knowledge of the basic data structures (trees, graphs, etc.) and algorithms which manage them.
- Knowledge of basic algorithm techniques, principles of software engineering, analysis of computational complexity.
- Fluency in programming with high level OOP languages (p.e. Java).

Capability of working in groups is also required.

3. Justification in the curriculum, relation to other subjects and to the profession

This subject introduces the basic techniques of Artificial Intelligence in the degree. Such techniques are often required nowadays for the solution of complex problems: decision making, diagnose systems, control and monitoring, web search, semantic web, recommender systems, machine learning, data analysis and mining, vision, robotics, etc.

The subject certainly requires some other subjects previous in the program - discrete maths, logic, programming- and is a pre requisite of some other posterior subjects such as data mining, knowledge based systems, multi agent systems, artificial intelligence, or robotic.

It is also a co-requisite which allows defining a software project with some other subjects such as information systems, data bases or software engineering.

4. Degree competences achieved in this course

Course competences

Code	Description
BA4	Basic knowledge about the uses and programming of computers, operating systems, data bases, and digital programmes with applications in engineering.
CO15	Knowledge and application of fundamental principles and basic techniques on intelligent systems and their practical applications.
INS1	Analysis, synthesis, and assessment skills.

SIS1 Critical thinking.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Knowledge about the basic principles and techniques of intelligent systems and their practical application.

Additional outcomes

Knowledge on population-based metaheuristics, basically genetic algorithms. Application to real-world problems.
Solving problems by using uniformed and informed search. Selection of the right technique for a given problem.
Knowledge on combinatorial optimization problems. How to define them.
Knowledge on local-search metaheuristics.
Design and implementation of adversarial search algorithms.
Knowledge on rule-based systems. Main components and architectures.
Solving problems by using machine learning.
Knowledge on basics algorithms for supervised and un-supervised classification.

6. Units / Contents

Unit 1: Introduction
Unit 2: Search in the state-space.
Unit 3: Heuristic search.
Unit 4: Adversarial search.
Unit 5: Learning agents.
Unit 6: Combinatorial optimization problems.
Unit 7: Metaheuristics: local search
Unit 8: Metaheuristics: genetic algorithms.
Unit 9: Rule-based systems.
Unit 10: Machine learning.
Unit 11: Supervised classification: rules and trees.
Unit 12: Unsupervised classificacion: clustering.

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	R	Description
Class Attendance (theory) [ON-SITE]	Lectures	CO15	1.12	28	N	-	-	Lectures will be supported by presentations/slides. Although exposition/talk will be the main method used in class, we reserve hours to carry out some other kind of activities, depending on the corresponding unit/content: puzzle, seminar, workgroup, etc.
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	CO15 INS1 SIS1	0.32	8	Y	N	N	We will solve some of the exercises proposed in class, as well as those proposed via virtual campus. After each block of content, we will also propose a set of related exercises that students will have to solve individually (using office hours for help if needed). In some cases, in order to evaluate the skills adquired, professors will use individual evaluation tools. In classes dedicated to problem solving, we will also give the keys for correction in evaluation activities based in pair-review for each of the problem sheet proposed. In both cases, the student will receive a mark for each block of problems.
Class Attendance (practical) [ON-SITE]	Combination of methods	BA4 CO15	0.24	6	N	-	-	Each one of the assignments that must be solved and submitted (initially 3) will be introduced in a class. Previously, we will provide a detailed description of each asignment. Therefore, the class will be used to show the code templates and execution issues, and also to explain what are the objectives that must be fullfilled in the solutions. We also include here the support to students that

								will be provided in class during the development of the assignments.
Computer room practice [ON-SITE]	Project/Problem Based Learning (PBL)	BA4 CO15	0.48	12	N	-	-	Groups of two students (exceptionally we will allow groups of three or even individual work) must study the proposed problem, and develop the agent and algorithms (by following the indications in the instructions). Finally, once the solution is tested, they must carry out the experiments necessary to validate the work. This activities involve both programming in the classroom, as well as discussion/collaboration with classmates.
Project or Topic Presentations [ON-SITE]	Project/Problem Based Learning (PBL)	INS1 SIS1	0.08	2	Y	N	N	Optionally, students can carry out some other works related with the contents of the course, either individually or by small groups. These works must consist in the study of some technique or the solution of some problem, and must be exposed in class.
Progress test [ON-SITE]	Assessment tests	CO15 INS1	0.16	4	Y	Y	Y	In order to evaluate the solutions for the practical assignments, we will carry out individual interviews. Some intermediate evaluations can also be done in order to evaluate the evolution of each lab assignment.
Study and Exam Preparation [OFF-SITE]	Self-study	BA4 CO15 INS1 SIS1	1.68	42	N	-	-	Students must also carry out their own study and preparation. In order to do that, and besides the slides and notes used in class, we provide (online) aditional material. The knowledge adquire must be also used for exercise solving and pair-review of their classmates, being this two activities the best training to pass the course.
Writing of reports or projects [OFF-SITE]	Problem solving and exercises	BA4 CO15 INS1 SIS1	0.96	24	Y	N	Y	Besides study and comprehension of theory, students will have to work in exercises and problems that, afterwards, will be solved in class.
Practicum and practical activities report writing or preparation [OFF-SITE]	Practical or hands-on activities	INS1 SIS1	0.72	18	Y	Y	Y	Techniques studied in theory class will be implemented to create intelligent agents that act in different environments. Besides programming, it is important that the student/group elaborate a report where structure, writing and contents must be cared of. This way, we intend to reiforce the adquisition of competence INS1.
Analysis of articles and reviews [OFF-SITE]	Reading and Analysis of Reviews and Articles		0.24	6	Y	N	Y	We will provide aditional material that will help to put in context, justify, and amplify the contents of the course.
		Total:	**6**	**150**				
		Total credits of in-class work: 2.4						**Total class time hours: 60**
		Total credits of out of class work: 3.6						**Total hours of out of class work: 90**

As: Assessable training activity
Com: Training activity of compulsory overcoming
R: Rescheduling training activity

8. Evaluation criteria and Grading System

	Grading System		
Evaluation System	**Face-to-Face**	**Self-Study Student**	**Description**
Final test	55.00%	0.00%	(ESC) Individual-written exam that must be carry out by all students. It is mandatory to obtain a minimum mark (5/10) to pass the course.
			[LAB] The weight of the mark obtained in the assignments is 40% of the final mark. Students (in pairs) must carry out practice

Laboratory sessions	17.50%	0.00%	in the class room, and will also have to carry out autonomous work. The evaluation will consider code (correctness and eficiency), the report, etc, and will be made by means of individual interviews. Besides testing the correctness of the work, the students must demonstrate their comprehension of the problem and the solution(s) develped. It is MANDATORY to PASS each one of the assignments to pass the course.
Practicum and practical activities reports assessment	7.50%	0.00%	[LAB 50%] [INF 50%] Competence related with synthesis must be adquired in this course. Therefore, we will evaluate the reports that describe the solutions to the different assighments. We will consider correctness, structure, ortography, grammar, expression, vocabulary, etc. Graphics, diagrams, etc., will be evaluated positivelly if used properly. It is MANDATORY to reach a minimun quality with the reports to pass the assignments and, therefore, to pass the course.
Assessment of problem solving and/or case studies	8.00%	0.00%	[INF] We will propose exercises and problems that sudents must be solve individually, and submit in due time. This activity is associated with evaluation by pair review among classmates. Totally, this task will weight 16% of the mark. Pair review is mandatory to be evaluated.
Other methods of assessment	10.00%	0.00%	[PRES] Each group must present its practice and answer several questions in a personal interview. Intermediate evaluations will count as much as the 20% of the total grade of each lab assignment. IMPORTANT: All students in a group must carry out the interview so that this part can be evaluated. Although submission is carry out by each group, the interview evaluates each student individually. It is possible that we plan a session where each group must expose its assignment to the rest of students.
Self Evaluation and Co-evaluation	2.00%	0.00%	[INF] This task is related with the solution of problems and exercises. Students will receive solutions and an evaluation guide, that must be used to carry out individual correction of the problems submitted by two classmates.
Total:	**100.00%**	**0.00%**	

Evaluation criteria for the final exam:
- It is compulsory to pass the theory part in order to pass the subject (mark >= 5).
- It is compulsory to pass all the assignments (mark >= 5) in order to pass the subject.
- Doing the problem sets and/or questionnaires is not compulsory, but highly recommendable.

- The final mark is obtained as 0.55*theory + 0.35*lab_assignments + 0.1*questionnaires.

- The mark for the theory part will be maintained for the extra exam session.
- The mark for each laboratory assignment will be maintained for the extra exam session.

Specifications for the resit/retake exam:
- The final mark is based only in the theory and lab parts. Problem sets and/or questionnaires are not considered.
- The final mark is obtained as 0.65*theory + 0.35*lab_assignments, provided that each part has mark >= 5.

Specifications for the second resit / retake exam:
- The final mark is based only in the theory and lab parts. Problem sets and/or questionnaires are not considered.
- The final mark is obtained as 0.65*theory + 0.35*lab_assignments, provided that each part has mark >= 5.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	**hours**
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	8
Class Attendance (practical) [PRESENCIAL][Combination of methods]	6
Computer room practice [PRESENCIAL][Project/Problem Based Learning (PBL)]	12
Project or Topic Presentations [PRESENCIAL][Project/Problem Based Learning (PBL)]	2
Progress test [PRESENCIAL][Assessment tests]	4
Writing of reports or projects [AUTÓNOMA][Problem solving and exercises]	24
Practicum and practical activities report writing or preparation [AUTÓNOMA][Practical or hands-on activities]	18
Analysis of articles and reviews [AUTÓNOMA][Reading and Analysis of Reviews and Articles]	6

Unit 1 (de 12): Introduction

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	1.5

Unit 2 (de 12): Search in the state-space.

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	4.5

Unit 3 (de 12): Heuristic search.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	4.5
Unit 4 (de 12): Adversarial search.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	4.5
Unit 5 (de 12): Learning agents.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	6
Unit 6 (de 12): Combinatorial optimization problems.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Unit 7 (de 12): Metaheuristics: local search	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Unit 8 (de 12): Metaheuristics: genetic algorithms.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Unit 9 (de 12): Rule-based systems.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Unit 10 (de 12): Machine learning.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	1.5
Unit 11 (de 12): Supervised classification: rules and trees.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	4.5
Unit 12 (de 12): Unsupervised classificacion: clustering.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Global activity	
Activities	**hours**
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	8
Computer room practice [PRESENCIAL][Project/Problem Based Learning (PBL)]	12
Project or Topic Presentations [PRESENCIAL][Project/Problem Based Learning (PBL)]	2
Progress test [PRESENCIAL][Assessment tests]	4
Class Attendance (theory) [PRESENCIAL][Lectures]	28
Class Attendance (practical) [PRESENCIAL][Combination of methods]	6
Study and Exam Preparation [AUTÓNOMA][Self-study]	42
Writing of reports or projects [AUTÓNOMA][Problem solving and exercises]	24
Practicum and practical activities report writing or preparation [AUTÓNOMA][Practical or hands-on activities]	18
Analysis of articles and reviews [AUTÓNOMA][Reading and Analysis of Reviews and Articles]	6
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Nilsson, Nils J.	Inteligencia artificial : una nueva síntesis	McGraw Hill		84-481-2824-9	2000	
Palma Méndez, José T.; Marín Morales, Roque Luis	Inteligencia artificial : técnicas, métodos y aplicaciones	McGraw Hill		978-84-481-5618-3	2008	
	http://www.mcgraw-hill.es/html/8448156188.html					
Russell, Stuart J.	Inteligencia artificial : un enfoque moderno	Pearson		978-84-205-4003-0	2007	
	http://aima.cs.berkeley.edu/					