Course guide
270722 - KRE - Knowledge and Representation Engineering

Last modified: 16/02/2022

Unit in charge: Barcelona School of Informatics
Teaching unit: 1042 - URV - Universitat Rovira i Virgili.

Degree: MASTER'S DEGREE IN ARTIFICIAL INTELLIGENCE (Syllabus 2017). (Optional subject).

Academic year: 2021 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: DAVID RIAÑO RAMOS

Others: Segon quadrimestre:
DAVID RIAÑO RAMOS - 10

PRIOR SKILLS

Self-contained subject.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEA12. Capability to understand the advanced techniques of Knowledge Engineering, Machine Learning and Decision Support Systems, and to know how to design, implement and apply these techniques in the development of intelligent applications, services or systems.
CEA13. Capability to understand advanced techniques of Modeling , Reasoning and Problem Solving, and to know how to design, implement and apply these techniques in the development of intelligent applications, services or systems.
CEP2. Capability to solve the decision making problems from different organizations, integrating intelligent tools.

Generical:
CG3. Capacity for modeling, calculation, simulation, development and implementation in technology and company engineering centers, particularly in research, development and innovation in all areas related to Artificial Intelligence.

Transversal:
CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

CT5. APPROPIATE ATTITUDE TOWARDS WORK: Capability to be motivated for professional development, to meet new challenges and for continuous improvement. Capability to work in situations with lack of information.
CT6. REASONING: Capability to evaluate and analyze on a reasoned and critical way about situations, projects, proposals, reports and scientific-technical surveys. Capability to argue the reasons that explain or justify such situations, proposals, etc..

Basic:
CB6. Ability to apply the acquired knowledge and capacity for solving problems in new or unknown environments within broader (or multidisciplinary) contexts related to their area of study.

TEACHING METHODOLOGY

Introductory Activities: Introduction of the lecturer, the objectives of the subject, the contents, the teaching methodology, evaluation process, and the supporting material.

Master Session: The lecturer will explain the basic contents of the subject with examples. (S)he will provide the student all the material required to prepare the subject.

Solving problems and exercises in ordinary class: In groups we'll study a tool for knowledge management and we'll do a practical work. Each group will present the results to the lecturer.

LEARNING OBJECTIVES OF THE SUBJECT

1.Differentiate between the concepts data, information and knowledge, and their technologies.
2.Know and know how to use alternative knowledge representation formalisms.
3.Know how to apply knowledge engineering methods for concrete problems.

STUDY LOAD

Type	Hours	Percentage
Self study	96,0	64.00
Laboratory classes	10,0	6.67
Theory classes	20,0	13.33
Practical classes	20,0	13.33
Guided activities	4,0	2.67

Total learning time: 150 h

CONTENTS

Introduction and Concepts

Description:
Data, Information and Knowledge; Knowledge Types and Uses; Knowledge Representation; Knowledge Engineering; Syntax and Semantics.

Knowledge Representation

Description:
First order logic; Rules and production systems; Object-Oriented Representations; Network Representation; Ontologies

Knowledge Engineering

Description:
Knowledge Life-Cycle; Knowledge Audit; Knowledge Acquisition; Detailed Case-Study.

Knowledge Representation in the Web

Description:
Representing data with HTML; Formalization and representation of information with DTD, XMLSchema, XML; Tools for data and information management on the web with XPath and XSL; Formalization and representation of knowledge with RDF and OWL2.

ACTIVITIES

Introduction

Description:
Academic description of the subject, contents, evaluation process, etc.

Full-or-part-time: 1h
Theory classes: 1h

Regular master class

Description:
Introduction of the important concepts of the course, the relevant technologies, and the promotion of assimilation with specific and clear examples.

Specific objectives:
1, 2, 3

Full-or-part-time: 64h
Theory classes: 49h
Self study: 15h

Knowledge representation test

Description:
Test with practical exercises and theoretical questions.

Specific objectives:
1, 2

Full-or-part-time: 12h
Guided activities: 2h
Self study: 10h

Knowledge Enginering test

Description:
Test of practical exercises and theoretical questions on knowledge engineering.

Specific objectives:
3

Full-or-part-time: 12h
Guided activities: 2h
Self study: 10h

Practical work of representation of knowledge

Description:
Work in a group where the construction of a knowledge base through software is exercised

Specific objectives:
2

Full-or-part-time: 16h 30m
Self study: 16h 30m

Practical work of representation of knowledge on the Web

Description:
Work in a group where the construction of a web ontology is carried out through Protege.

Full-or-part-time: 4h
Self study: 4h

GRADING SYSTEM

(50%) Problems and exercises resolution in ordinary class: Thorough the course there will be several partial tests.

(50%) Objective tests with short questions: Objective tests with short questions every other week of 30 min each. We'll devote one of these tests (this one of 2h) to evaluate the total content of the subject.

The student who don't pass the evaluation, will have a reparatory exam on the full contents of the subject (100% of the final mark).

BIBLIOGRAPHY

Basic:
- Brachman, R.J.; Levesque, H.J. Knowledge representation and reasoning. Amsterdam: Elsevier, 2004. ISBN 1558609326.

Complementary:
- Chaudhri, V.K. CS 227: Knowledge representation and reasoning (course at Stanford University) [on line]. Stanford University, 2011 [Consultation: 27/04/2022]. Available on: https://web.stanford.edu/class/cs227/.
- Kelly, R.V. Practical knowledge engineering: creating successful commercial expert systems. New England: Digital Equipment Corporation, 1991. ISBN 9781555580704.
- Kendal, S.; Creen, M. An introduction to knowledge engineering. London: Springer, 2007. ISBN 9781846284755.