Universidad Carlos III de Madrid

Semantic Web and Search Engines

Academic Year: (2023 / 2024)   **Review date: 19-05-2023**

Department assigned to the subject: Telematic Engineering Department

Coordinating teacher: SANCHEZ FERNANDEZ, LUIS

Type: Electives ECTS Credits : 3.0

Year : 1 Semester :

OBJECTIVES

At the end of this subject students must know what are the Semantic Web and Linked Data, and which are the key technologies, concepts, algorithms and standards in which the Semantic Web, Linked Data, and Web search engines are based.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction to the Semantic Web and Linked Data.
1.1. Review of Web architecture.
1.2. Semantic Web fundamentals.
1.3. Evolution of the Semantic Web.
1.4. Linked Data.
2. Representation languages.
2.1. Introduction to representation languages.
2.2. RDF/RDF Schema.
2.3. OWL.
2.4. Other languages.
3. Knowledge modeling.
3.1. Ontologies. Ontology engineering.
3.2. Knowledge graphs.
4. Knowledge exploitation.
4.1. SPARQL query language.
4.2. Logical reasoning with RDF and OWL.
4.3. Tools.
5. Semantic annotation
5.1. Types of annotations.
5.2. Techniques and tools.
6. Web Search Engines.
6.1. Fundamentals and history.
6.2. Vector model for Information Retrieval.
6.3. Natural Language Processing techniques for Information Retrieval.
6.4. Inverted indexes.
6.5. Link Mining.
6.6. Semantic technology for search engines.
7. Implementation of Information Retrieval Systems.
7.1. Customary data bases.
7.2. NoSQL solutions.
7.3. Graph databases.
7.4. Vector databases.

LEARNING ACTIVITIES AND METHODOLOGY

Learning activities

Lectures

Practical sessions
Labs
Tutoring
Group work
Student's individual work
Final and partial exams

Methodology

Lectures
Case studies
Assignments

Students can request individual tutoring sessions when needed.

ASSESSMENT SYSTEM

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

- Class participation 10%
- Individual or group work 30%
- Final exam 60%

The second call evaluation will consist of a written exam.

BASIC BIBLIOGRAPHY

 - Asunción Gómez-Pérez, Mariano Fernández-López, Óscar Corcho Ontological Engineering-with examples from the areas of Knowledge Management, e-Commerce and the Semantic Web, Springer, 2004

 - Bing Liu Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data, Springer, 2011

 - Christian Bizer, Tom Heath, and Tim Berners-Lee "Linked data: The story so far." in: (Amit Sheth, ed.) Semantic services, interoperability and web applications: emerging concepts, IGI Global, 2011

 - Ricardo Baeza-Yates, Berthier Ribeiro-Neto Modern Information Retrieval, Pearson Education, 2011

 - Tim Berners-Lee, James Hendler, Ora Lassila The semantic web. Scientific American, vol. 285, n. 5. , Springer Nature, 2001