Course title: KNOWLEDGE BASES AND SEMANTIC WEB

<table>
<thead>
<tr>
<th>Lecturers</th>
<th>Assoc.Prof. Sandra Lovrenčić, Ph.D.</th>
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<tbody>
<tr>
<td>Language of instruction:</td>
<td>Croatian and English</td>
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<tr>
<td>Schedule:</td>
<td>60 teaching hours</td>
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<td>(30 hours lectures + 30 laboratory exercises/seminars)</td>
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<tr>
<td>Study level</td>
<td>Master</td>
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<td>Study programme</td>
<td>Databases and Knowledge Bases</td>
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<tr>
<td>Semester</td>
<td>Winter</td>
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<td>ECTS</td>
<td>5</td>
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Goal of course: Knowledge Bases and Semantic Web is to teach students about two important, intertwined areas that are dealing with intelligent structuring and intelligent data (information) processing in the Web environment. Structured data, in mutual dynamic interaction, with combination of classic search and deductive derivation, result in knowledge bases. Lately, concept of knowledge base is replaced by concept of ontology. Semantic Web is placed in the Web context and ensures intelligent approach to heterogeneous, distributed information content. Application areas are constantly spreading and today comprise knowledge management (including business rule systems), electronic commerce (including automatic negotiation systems), natural language processing, etc.

The course will give students necessary theoretical knowledge, teach them about modern programming languages and tools, and train them through practical work on computers to use and develop Semantic Web system. After the completion of the course, the students should be able to:

- Understand and describe the basic principles, goals and structure of the Semantic Web
- Understand the concept of a knowledge bases and describe their structure
- Understand the purpose and possibilities of knowledge base and explain their use
- Understand the concept of ontology as a knowledge base and adopt
the method of ontology development and validation

- Know how to develop a knowledge base (ontology) with standardized languages using description logics
- Know how to carry out structural subsumption and Tableau algorithm for reasoning over knowledge bases
- To be familiar with the latest technologies and tools for knowledge bases development within the Semantic Web
- Be able to identify and explain the constituent elements of Semantic Web applications

Content

1. Semantic Web Vision

2. Semantic Web Layers

3. Ontologies – Knowledge Bases
   The concept, definition types based on different divisions. Representation formalisms. Design principles, development methods, example of development, ontology examples for various domains. Evaluation – verification methods, validation methods.

4. Description Logics (DL)

5. Resource Description Framework (RDF)
6. **Web Ontology Language (OWL)**


7. **SPARQL Protocol and RDF Query Language (SPARQL)**


8. **Application of Semantic Web Technologies**

Areas of application through development of Semantic Web. Description and examples of applications – schema.org, Wikidata and Reasonator, KBpedia, BBC ontologies, Financial Industry Business Ontology (FIBO), data.gov.uk, Evi, Springer Nature SciGraph, EDAMAM... Open questions.

**Exercises**

In the course of the exercises students use program tools to work with knowledge bases / ontologies (currently including latest version of Protégé) and develop domain ontologies of their choice, as well as work on other tasks related to ontology languages.

**Preconditions**

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**Realization and examination**

Class: lectures, seminars, exercises

Examination: written exam, seminar paper, exercises, activity

**Related courses**

2. Ontology Engineering for the Semantic Web, University of Manchester, School of Computer Science, http://studentnet.cs.manchester.ac.uk/pgt/COMP62342/
5. Ontology Engineering, Tetherless World Constellation (TWC) at
| Rensselaer Polytechnic Institute, 6. Semantic Web Techniques, University of New Brunswick: Faculty of Computer Science, |

**Literature**

**Basic:**


**Additional:**