CO4216 Semantic Web

Credits: *15*   **Convenor:** *Dr. Yi Hong*   **Semester:** *2ⁿᵈ*

Prerequisites: *Essential: Background in HTML and XML*

Lectures:	*24*	*hours*				
Surgeries:	*8*	*hours*	**Class Test Hours:**	*1*	*hours*	
Laboratories:	*8*	*hours*	**Independent Study:**	*72.5*	*hours*	

Assessment: *Coursework: 40% + Two hour exam in May/June: 60%*

Subject Knowledge

Aims   The aim of this course is to teach the students the concepts, technologies and techniques underlying and making up the Semantic Web.

Learning Outcomes   At the end of the course the student should be able to: understand and discuss fundamental concepts, advantages and limits of the semantic web; understand and use ontologies in the context of Computer Science and the semantic web; use the RDF framework and associated technologies such as RDFa; understand the relationship between Semantic Web and Web 2.0.

Methods   Lectures, tutorials and practical sessions together with course notes, recommended reading, worksheets and some additional handouts.

Assessment   Assessed coursework; traditional written exam

Skills

Aims   Students who have taken this module should be able to understand the rationale behind Semantic web. They should be able to model and query domain knowledge as ontologies defined using standards such as RDF and OWL. Students should be able to apply the principles of ontological engineering to modelling exercises. Finally they should be able to understand the applications of semantic web to web services and Web 2.0.

Learning Outcomes   On successful completion of the module students should be able to:

- understand the rationale behind Semantic Web.

- model ontologies using Resource Description Framework (RDF).

- design RDF Schemas for ontologies.

- model and design ontologies using Web Ontology Language (OWL).

- query ontologies using SPARQL.

- understand and reflect on the principles of Ontology Engineering.

- make an association between Semantic web and Web 2.0.

- apply Semantic web technologies to real world applications.

Methods   Class sessions together with worksheets and lab assignments.

Explanation of Prerequisites   Students should have a basic understanding and knowledge of HTML and XML and related technologies.

Module Description   The Web, as it exists today, primarily supports human understanding and the interpretation of the vast information space it encompasses. However the Web was originally designed with a goal to support not only human-human communication but also as one that would enable automated machine processing of data with minimal human intervention. The Semantic Web is Tim Berners-Lee's vision of a machine understandable and unambiguously computer interpretable Web. The rationale behind such a system is that most of the data currently posted on the web is buried in HTML files suitable for human reading and not for computers to manipulate meaningfully. The semantic Web, an extension of the current web, can be thought of as a globally linked database where information is given well-defined meaning using metadata for better enabling computers and humans to work in close co-operation. The realisation of a Semantic Web will thus make machine reasoning more ubiquitous and devastatingly powerful, creating an environment where intelligent software agents can roam, carrying out sophisticated tasks for their users.

This course is about investigating the next generation of the Web whose key distinguishing characteristics will be the support for and use of semantics in new, more effective, more intelligent, ways of managing information and supporting applications.

Syllabus   Topics to be covered include:

- Introduction to the Semantic Web

- Introduction to Ontologies

- Ontology Languages for the Semantic Web

    - Resource Description Framework (RDF)
    - Lightweight ontologies: RDF Schema
    - Web Ontology Language (OWL)
    - A query language for RDF: SPARQL

- Ontology Engineering

- Semantic web and Web 2.0

- Applications of Semantic Web

Reading List

[A]   Grigoris Antoniou, Frank Van Harmelen, *A Semantic Web Primer,* MIT Press, 2008.

[A]   Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, *Foundations of Semantic Web Technologies,* CRC Press, 2009.

[B]   Dean Allemang, James Hendler, *Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL,* Morgan Kauffmann, ISBN-10: 0-12-373556-4.

[B]   Geroimenko, Vladimir; Chen, Chaomei (Eds.) 2nd ed., 2006, XIV, 248 p. 108 illus., Hardcover ISBN: 978-1-85233-976-0, *Visualizing the Semantic Web XML-based Internet and Information Visualization,* Springer-Verlag London Ltd; 2Rev Ed edition (Oct 2005).

[B]   Michael C. Daconta, Leo J. Obrst, Kevin T. Smith, *The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management: A Guide to the Future of XML, Web Services and Knowledge Management,* John Wiley & Sons (20 Jun 2003).

[B]   S Powers, *Practical RDF (Paperback) ,* OReilly (1 Aug 2003).

[B]   Thomas B. Passin, *Explorer's Guide to the Semantic Web (Paperback),* Manning Publications (8 Jul 2004).

Resources   Course notes, web page, study guide, worksheets, handouts, lecture rooms with two OHPs.

Module Evaluation   Course questionnaires, course review.