MODELLO D (inglese)			
General Information			
Academic subject	Semantic Web Technologies		
Degree course	Computer Science		
Curriculum			
ECTS credits	6		
Compulsory attendance	No		
Language	English		
Subject teacher	Name Surname	Mail address	SSD
	Claudia d'Amato	claudia.damato@uniba.it	ING/INF-05
ECTS credits details			
Basic teaching activities	5	Lectures	
Lab activities			
Work on own projects	1	design and code own solutions	
Class schedule			
Period	Fall / 1st sem.		
Year	2019		
Type of class	Lecture + Lab Activity		
Time management			
Hours	150		
Hours of lectures	125 (40 + 85)		
Tutorials and lab	25 (proj.)		
Academic calendar			
Class begins	September 2019		
Class ends	January 2020		
Syllabus			
Prerequisites/requirements	Notions and basic proficiency in *knowledge engineering* and *artificial intelligence* topics (knowledge representation and reasoning, machine learning), Advanced databases, Web Programming		
Expected learning outcomes (according to Dublin Descriptors) (it is recommended that they are congruent with the learning outcomes contained in A4a, A4b, A4c tables of the SUA-CdS)	***Knowledge and understanding*** The student is expected to acquire advanced theoretical and methodological abilities required to comprehend the Semantic Web infrastructure and, specifically, in terms of the foundations for the representation of large distributed knowledge bases made up of semantically annotated structured data (the *Web of Data*), their production/consumption, including the semantics of the related services. S/he will become acquainted with relevant scientific literature on the main topics/problems in the research area ***Applying acquired knowledge and understanding*** The expected ability concerns the design and implementation of data-sources for the publication of datasets as *Linked Data*; in particular: the ability of modeling data in terms of standard Semantic Web vocabularies and proficiency with the current technologies for publishing, storing, querying (reasoning), managing linked data-sources Acquisition of the ability of designing and coding predictive systems for *Linked Data* with their application to problems such as categorization, semantic search, data/knowledge semantic integration (interoperability) of data and services Development of integrated Web services on a semantic level to enable / create new applications / services (*semantic mashup*)		

	Making informed judgements and choices Acquiring the ability of interpreting the analytics on the performance of the implemented solutions through empirical tests ***Communicating knowledge and understanding*** Ability of presenting advanced topics, problems, solutions, e.g. within a design/development team, refined through group-work on specific case studies. ***Capacities to continue learning*** The student is expected to show agility, pro-activity and independence while coping with the latest findings/developments of the research context and the related evolving technological solutions
Contents	▪ ***Semantic Web Overview*** ▫ Basics and evolution of the Web, XML. Limitations of the Documents Web Web 2.0. ▫ Adding semantics, building blocks of the semantic Web, semantic annotation of Web pages. The Semantic Web as a *Web of Data* ▪ ***Representation: languages for the Semantic Web*** ▫ RDF. N-Triples and notations. Built-in terms in RDF. Anonymous resources (blank nodes). Literal qualification: languages and data-types. RDF/XML notation ▫ RDF-S: Classes of RDF-S. Predicates in RDF-S. Other predicates. Reflection in RDF and RDF-S ▫ OWL: Notations for OWL. Built-in terms. Classes and structured proprieties. Statements on classes, properties, and individuals. Classes, predicates, individuals, and data-types ▫ SKOS: conceptual schemata in SKOS ▪ ***Ontologies: the Semantic Web Vision*** ▫ Standard Vocabularies: DublinCore, FOAF, GoodRelations, DBPedia, ... ▫ Linked Data: the five-star rating of LOD, generation, Publication. Access, Applications ▪ ***Query*** ▫ SPARQL as a query language ▫ SPARQL endpoints. Define SPARQL queries: prefix declaration ▫ Query forms ▫ Datasets and graphs. Graph pattern. Query modifiers. Blank nodes and RDF Collections ▪ ***Data Publication*** ▫ Microformats, RDFa, A model for RDF triples extraction and generation. Triple Concatenation. Blank nodes and typeOf attribute ▫ HTML 5, GRDDL ▪ ***Storage*** ▫ metadata modeling in relational systems. Storage of RDF data via relational systems. RDF as data. RDF and the relational model. ▫ Querying RDF data stored in relational systems ▫ Jena: create and serialize an RDF Model. Encapsulation of a vocabulary in a Java Wrapper Class. Using complex structures. Creation of typed nodes and containers. Parsing of RDF docs. Jena storage models ▫ triple stores and graph DBs ▪ ***Reasoning*** ▫ basics on *Description Logics* ▫ Reasoning with RDF / RDF-S, OWL ▪ ***Semantic Web Services Basics*** ▫ OWL-S, WSMO, … ▪ **Knowledge Graphs** ▫ Google Knowledge Graph, DBPedia, YAGO, ...

Course program	
Bibliography	P. Hitzler, M. Krötzsch, S. Rudolph: *Foundations of Semantic Web Technologies*. CRC Press Heath & Bizer Linked Data: *Evolving the Web into a Global Data Space.* 1st/ed. Morgan & Claypool Di Noia, De Virgilio, Di Sciascio, Donini*: Semantic Web: Tra ontologie e Open Data.* Apogeo Dean & Hendler. *Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL*. Elsevier. Breitman, Casanova, Truszkowski: *Semantic Web: concepts, technologies and applications*. Springer. W3C Standards: http://www.w3.org/standards/semanticweb/ handoffs [integrated with scientific paper appeared on prominent journals of / conference proceedings of the research area
Notes	Additional material to distributed through the e-learning platform website
Teaching methods	class lectures, hands-on sessions
Assessment methods (indicate at least the type written, oral, other)	Oral discussion focused on the project realized in small groups and the theory of the lecture
Evaluation criteria (Explain for each expected learning outcome what a student has to know, or is able to do, and how many levels of achievement there are.	Quality of the projects: - proficiency with the relevant knowledge and known solutions (and technical precision in communicating the acquired expertise) - insight in the problems - creativity/originality/independence - ability to evaluate benefits and limitation of the solutions
Further information	Suggested pre-requisites: • Knowledge Engineering • Artificial Intelligence