**KNOWLEDGE REPRESENTATION (Elective course)**

**Credits:** 3

**Objective:** Introduce the students to the field of knowledge representation, with the goal of reasoning about knowledge. The students will be exposed to specialized knowledge representations stemming from applications in different domains, such as, semantic web and cognitive robotics.

**Learning Outcomes**: Students, on successful completion of the course, will be able to

1. Use logical formalisms to effectively describe knowledge, belief, events, and situations
2. Identify the components of nonmonotonic reasoning and its usefulness as representation mechanism for knowledge systems
3. Design real world knowledge-based systems

**Prerequisites:** Artificial Intelligence.

**Course Outline**:

1. Knowledge Representation and Reasoning
   1. Ontologies
   2. Conceptual Graphs
   3. Linked Data and Semantic Web
   4. Description Logics and UML
   5. Nonmonotonic Reasoning,
   6. Answer Sets
   7. Rule-based, Model-based and Case-based Reasoning
2. Classes of Knowledge and Specialized Representations
   1. Reasoning about Knowledge and Belief
   2. Reasoning about Actions, Events, and time
   3. Situation Calculus
   4. Event Calculus and Transaction Logic
3. Knowledge Representation in Applications
   1. Semantic Web
   2. Cognitive Robotics
   3. Knowledge Engineering

**Practical Sessions:** The lectures are accompanied by practical session where the students work in small groups to solve real problems based on the knowledge acquired during the lectures.

**Learning Resources:**

Reference Books:

* van Harmelen, F., Lifschitz, V., and Porter, B., editors (2007), *Handbook of Knowledge Representation,* 1st edition, Elsevier.
* Heath, T. and Bizer, C. (2011), Linked Data: Evolving the Web into a Global Data Space, 1st edition. Synthesis Lectures on the Semantic Web: Theory and Technology, Morgan & Claypool.

**Teaching and Learning Methods**:

1. *Direct instruction* based teaching for the lectures using visual aid via slides
2. *Self-learning* method for in-depth knowledge of specialized topics
3. *Inquire based* teaching for the practical sessions

**Evaluation Components**

1. Exam
2. Group assignments