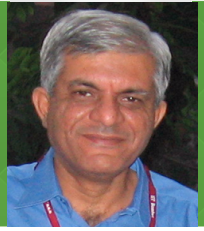

ARTIFICIAL INTELLIGENCE: KNOWLEDGE REPRESENTATION AND REASONING

PROF. DEEPAK KHEMANI
Department of Computer Science and Engineering
IIT Madras

PRE-REQUISITES : Some exposure to formal languages, logic and programming

INTENDED AUDIENCE : BE/ME/MS/MSc/PhD students

INDUSTRIES APPLICABLE TO : Software companies dealing with knowledge and reasoning, including the semantic web and semantic search

COURSE OUTLINE :
An intelligent agent needs to be able to solve problems in its world. The ability to create representations of the domain of interest and reason with these representations is a key to intelligence. In this course we explore a variety of representation formalisms and the associated algorithms for reasoning. We start with a simple language of propositions, and move on to first order logic, and then to representations for reasoning about action, change, situations, and about other agents in incomplete information situations. This course is a companion to the course Artificial Intelligence: Search Methods for Problem Solving that was offered recently and the lectures for which are available online.

ABOUT INSTRUCTOR :
Prof. Deepak Khemani is Professor at Department of Computer Science and Engineering, IIT Madras. He completed his B.Tech. (1980) in Mechanical Engineering, and M.Tech. (1983) and PhD. (1989) in Computer Science from IIT Bombay, and has been with IIT Madras since then. In between he spent a year at Tata Research Development and Design Centre, Pune and another at IIT, Mandi. He has had shorter stays at several Computing departments in Europe. Prof Khemani's long-term goals are to build articulate problem solving systems using AI that can interact with human beings. His research interests include Memory Based Reasoning, Knowledge Representation and Reasoning, Planning and Constraint Satisfaction, Qualitative Reasoning and Natural Language Processing.

COURSE PLAN :

Week 1: Introduction. History and Philosophy.
Week 2: Symbolic Reasoning. Truth, Logic, and Provability.
Week 3: Propositional Logic. Direct Proofs. The Tableau Method.
Week 4: First Order Logic. Universal Instantiation. The Unification Algorithm.
Week 5: Forward and Backward Chaining. The Resolution Refutation Method.
Week 6: Horn Clauses and Logic Programming. Prolog.
Week 7: Rule Based Systems. The OPS5 Language. The Rete Algorithm.
Week 8: Representation in First Order Logic. Conceptual Dependency.
Week 9: Frames. Description Logics and the Web Ontology Language
Week 10: Taxonomies and Inheritance. Default Reasoning.
Week 11: Circumscription. Auto-epistemic Reasoning. Event Calculus
Week 12: Epistemic Logic. Knowledge and Belief.