Master of Science in Artificial Intelligence (MSAI)								
Course Name	Automated Reasoning and *Planning		الاستدلال والتخطيط الآلي					
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)				
	0911-1664	664	3 (3-0-6)	Foundations of AI				
Course Track	Program Core		Electives					

Course Description. In many applications, we expect computers to reason logically and generate a set of logical actions. We might naively expect this to be what computers are good at, but in fact they find these extremely difficult. This course looks at various methods to automate logical reasoning and planning procedure, which are needed to support a variety of application domains. Automated reasoning procedures are parametrized by the logic they are capable of reasoning with. The course distinguishes between propositional logic and first-order logic inferences. Development and application of propositional logic procedures will be described in details, e.g., solving constraint satisfaction problems, applications in hardware design, verification, and planning and scheduling. The course discusses applications, standard deductive procedures such as resolution, and basic concepts, such as unification. This course will also investigate the aspect of automated reasoning that overlaps with automated planning. Examples of combining the automated reasoning techniques with planning methods will be presented referring to recent research trends, which includes planning as satisfiability using propositional logic, planning as non-monotonic logic, and Flexible planning as fuzzy description logic. The theory and algorithms we will be exploring in this course are applicable to a diversity of problems beyond the development of intelligent agents or cognitive robots, including software and hardware verification, program synthesis, activity recognition, plan understanding, and automated monitoring and diagnosis. The course project explores an application of reasoning based planning.

Course Outcomes. After the completion of this course, the student will be able to:

1. **Describe** the basic principles of reasoning via propositional and first-order logic [A]

- 2. Identify differences between propositional vs. first-order inference systems [A]
- 3. Analyze and solve first-order logic instances using standard deduction procedures [A]
- 4. **Combine** planning methods as satisfiability with appropriate reasoning techniques [E]

5. Relate and adapt the application of reasoning based plaining to various problem domains [E]									
Assessment Policy (TC)	Assignments	10%	Quiz	10%	Capstone	20%			
	Midterm	20%	Final	40%	Project	2070			
Textbook	 Alan Robinson, Andrei Voronkov, "Handbook of Automated Reasoning (Volume 1)", North Holland, 1st Edition, 2001. ISBN-13: 978- 0444508133. Malik Ghallab, Dana Nau, Paolo Traverso, "Automated Planning: Theory and Practice", Elsevier, 1st Edition, 2004. ISBN-13: 978- 1558608566. 								
References	James Allen; Henry Kautz; Richard Pelavin; Josh Tenenberg, "Reasoning about plans", Publisher- Morgan Kaufmann, 1992. ISBN-13: 978-1558601376.								

5. **Relate** and adapt the application of reasoning based planning to various problem domains **[E]**