Dreaman and	Computing C Information Calonse				
Program and Course Code	Computing & Information Science CIS504				
	CIS504 Techniques in Artificial Intelligence				
Course Title					
Credit Hours	3				
Instructor	Iyad Rahwan				
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Information					
Office Hours	ТВА				
Bulletin Course Description	This course is a graduate-level introduction to the field of artificial intelligence (AI). It aims to give students a solid understanding of the main abstractions and reasoning techniques used in AI. Topics include: representation and inference in first-order logic; modern deterministic and decision-theoretic planning techniques; basic supervised learning methods; and Bayesian network inference and learning.				
Pre-requisites	Background in computer programming, undergraduate algorithms and data structures, and basic discrete mathematics and probability theory.				
Co-requisites	None				
Course Objectives (Learning Outcomes of the Course)	Subject-specific skills: By the end of this course, the student must be able to: o Use various symbolic knowledge representation to specify domains and reasoning tasks of a situated software agent. o Use different logical systems for inference over formal domain representations, and trace how a particular inference algorithm works on a given problem specification. o Understand the conceptual and computational trade-offs between the expressiveness of different formal representations. Transferable skills: Upon completion, students will be able to: o Use key logic-based techniques in a variety of research settings; o communicate scientific knowledge at different levels of abstraction.				

Week	Course Topics and Contents			
1	Revision of search algorithms, and introduction to A* search			
2	Propositional logic: syntax, semantics, and inference by resolution			
3	First order logic: syntax, semantics and inference			
4	Constraint Satisfaction Problems (CSP) and their solutions			

5	Automated planning		
6	Partial-order planning, and the Graph Plan algorithm		
7	Representing uncertainty		
8	Mid-semester break		
9	Bayesian network inference (including variable elimination)		
10	Hidden Markov Models		
11	Utility and decision theory		
12	Markov Decision Processes (MDP)		
13	Partially Observable Markov Decision Processes (POMDP)		
14	Reinforcement learning		
15	Selected topics		
16	Final Exam		

Relationship of course objectives to program outcomes				
Program Outcome 1	Use and apply current technical concepts and practices in core computing and information technologies.			
Program Outcome 2	Analyze a problem, and identify and define the computing requirements appropriate to its solution.			
Program Outcome 3	Design, implement, and evaluate computer- based systems, processes, components, and programs both in teams and individually to meet desired outcomes.			

Out-of-class assignments	
Homework	

Course Grading	
A mid-term exam	20 %
A final exam	30 %
Two take-home project assignments	25 % each
Total	100 %

Assignment	Handed	Due	Торіс
1	Week 4	Week 10	Programming and applying search
2	Week 6	Week 15	Programming for learning and uncertainty

Class/Laboratory schedule and Methodology								
Class	The	class	meets	15	weeks,	2	lectures	per

	week, 90 minutes each.
Laboratory	
Teaching and learning methodologies	A combination of white board use, Power-point slide presentation, and interactive class discussions to encourage student participation and enhance the learning.

Course Materials				
Textbooks	S. Russell and P. Norvig. Artificial Intelligence: A Modern Approach. Prentice Hall, 3 <sup>rd</sup> edition, 2009 D. Poole and A. Mackworth. Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010 Available online: <u>http://artint.info/</u>			
Recommended Readings	<ul> <li>R. Brachman, H. Levesque. Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.</li> <li>G. Luger. Artificial Intelligence: Structures and Strategies for Complex Problem Solving. Addison Wesley; 6 edition, 2008</li> <li>E. Alpaydin. Introduction to Machine Learning. MIT Press, 2<sup>nd</sup> edition, 2010</li> <li>R. S. Sutton and A. G. Barto. Reinforcement Learning: An Introduction. MIT Press, 1998</li> </ul>			
Instructional material and resources				