



## Course Specification

**Course Name:** [Multi-Agent Systems ]

**Course Code:** [CS466]

### I. Basic Course Information

Major or minor element of program: Major

Department offering the course: [Computer Science Department]

Academic level: [400 Level]

Semester in which course is offered: [First (fall) Semester]

Course pre-requisite(s): [Artificial Intelligence [CS361] ]

Credit Hours: 3

Contact Hours Through:

Lecture	Tutorial *	Practical *	Total
2.5	0.0	1.5	4.0

\* 1.5 hours for **either** Tutorial or Practical

Approval date of course specification: September 2014

### II. Overall Aims of Course

[The aims of this course are to:

- Expand on the student's understanding and awareness of the concept of intelligent software/systems/platforms.
- Introduce the concept of 'Agency', concerning the creation of computer systems containing at least two important properties: First, they are capable of autonomous action, and second, they are capable of interacting with other agents.
- Build on the programming and problem solving skills developed in previous subjects studied by the student, to achieve an understanding of the development of intelligent agents, systems, and multi-agent systems platforms.]

### III. Program ILOs covered by course

Program Intended Learning Outcomes (By Code)			
Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
[K7,K18,K19 ]	[I10,I12,I15,I18 ]	[P6,P16 ]	[G1,G2,G5 ]



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### IV. Intended Learning Outcomes of Course (ILOs)

#### a. Knowledge and Understanding

On completing the course, students should be able to:

- K.1 Recognize the concept of agency with two important properties: being autonomous, and being able to interact with other agents and the environment.
- K.2 Explain the concept of intelligent software in a distributed computing environment.
- K.3 Describe the concepts of agents' communication, cooperation, and negotiation. ]

#### b. Intellectual/Cognitive Skills

On completing the course, students should be able to:

- I.1 Compare between an agent as a software component and other intelligent software components that are not agents.
- I.2 Compare between an agent as a software component and an object in object-oriented programming.
- I.3 Analyze types of agents.
- I.4 Examine agent communication languages. ]

#### c. Practical/Professional Skills

On completing the course, students should be able to:

- P.1 Design and implement cooperating agents on top of Multi-Agent Systems (MAS) platform.
- P.2 Design and implement negotiating agents on top of MAS platform. ]

#### d. General and Transferable Skills

On completing the course, students should be able to:

- G.1 Work effectively as part of a team to apply skills gained throughout the course to design and build a multi-agent system.
- G.2 Apply problem solving capabilities.
- G.3 Demonstrate the ability to use a variety of learning resources and acquire information. ]

### V. Course Matrix Contents

	Main Topics / Chapters	Duration (Weeks)	Course ILOs Covered by Topic (By ILO Code)			
			K & U	I.S.	P.S.	G.S.
1-	Introduction and Intelligent Agents ]	2 ]	[K1 ]	[I1,I2 ]	[ ]	[ ]
2-	Types of Agents ]	3 ]	[K1,K2 ]	[I3 ]	[ ]	[G2,G3 ]
3-	Agents Interaction ]	3 ]	[K3 ]	[I3 ]	[P1,P2 ]	[All ]
4-	Agents Communication ]	2 ]	[K3 ]	[I3,I4 ]	[P1,P2 ]	[All ]
5-	Applications for MAS ]	1 ]	[K2,K3 ]	[I1,I2,I3 ]	[P1,P2 ]	[G2, G3 ]
6-	Agent Methodologies ]	1 ]	[K1,K2 ]	[I1,I2 ]	[ ]	[G2,G3 ]
7-	Review ]	1 ]	[All ]	[I1,I2 ]	[ ]	[ ]
	<b>Net Teaching Weeks</b>	<b>13</b>				



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VI. Course Weekly Detailed Topics / hours / ILOs

Week No.	Sub-Topics	Total Hours	Contact Hours	
			Theoretical Hours	Practical Hours *
1	Introduction to the concept of Agency	2.5	2.5	
2	Intelligent Agents	4	2.5	1.5
3	Deductive Reasoning Agents	4	2.5	1.5
4	Practical Reasoning Agents	4	2.5	1.5
5	Reactive and Hybrid Agents	4	2.5	1.5
6	Multi-agent Interactions-1	4	2.5	1.5
7	<b>Midterm Exam</b>			
8	Multi-agent Interactions-2	4	2.5	4
9	Reaching Agreements	4	2.5	4
10	MAS Communication-1	4	2.5	4
11	MAS Communication-2	4	2.5	4
12	Applications for multi-agent systems	4	2.5	4
13	Agent Methodologies	4	2.5	4
14	Review	4	2.5	4
15	<b>Final Exam</b>			
<b>Total Teaching Hours</b>		<b>51</b>	<b>33</b>	<b>18</b>

\* No Practical/Tutorial during the first week of the semester

VII. Teaching and Learning Methods

Teaching/Learning Method	Selected Method	Course ILOs Covered by Method (By ILO Code)			
		K & U	Intellectual Skills	Professional Skills	General Skills
Lectures & Seminars	*	All	I1,I2		
Tutorials					
Computer lab Sessions	*		All		G2
Practical lab Work	*		All	All	G2
Reading Materials	*	All	I1,I2,I3		G3
Web-site Searches					
Research & Reporting					
Problem Solving / Problem-based Learning					
Projects					
Independent Work	*		All	All	G2,G3
Group Work	*			All	G1,G2
Case Studies					
Presentations					
Simulation Analysis					
Others (Specify):					



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VIII. Assessment Methods, Schedule and Grade Distribution

Assessment Method	Selected Method	Course ILOs Covered by Method (By ILO Code)				Assessment Weight / Percentage	Week No.
		K & U	I.S.	P.S.	G.S.		
Midterm Exam	*	All	I1,I2,I3			15%	7
Final Exam	*	All	All			60%	15
Quizzes							
Course Work							
Report Writing	*				G3	5%	5
Case Study Analysis							
Oral Presentations							
Practical	*		I2,I3,I4	All	G2	10%	3,4,6,9
Group Project	*			All	G1,G2	10%	12
Individual Project							
Others (Specify):							

IX. List of References

<b>Essential Text Books</b>	<ul style="list-style-type: none"> <li>Wooldridge, Michael. An Introduction to Multi Agent Systems. Second Edition. John Willey and Sons, 2009.</li> </ul>
<b>Course notes</b>	<ul style="list-style-type: none"> <li>PowerPoint presentations</li> </ul>
<b>Recommended books</b>	<ul style="list-style-type: none"> <li>Knapik, Michael and Jay Johnson. Developing Intelligent Agents for Distributed Systems: Exploring Architecture, Technologies, and Applications. McGraw-Hill, 1998.</li> <li>Lange, Danny B. and Mitsuru Oshima, IBM Research. Programming and Deploying Java Mobile Agents with Aglets. Addison-Wesley, 1998.</li> <li>Yoav Shoham and Kevin Leyton-Brown. <i>Multiagent Systems</i>. Cambridge University Press, 2009.</li> </ul>
<b>Periodicals, Web sites, etc...</b>	<ul style="list-style-type: none"> <li><a href="http://mas.cs.umass.edu/">http://mas.cs.umass.edu/</a></li> <li><a href="http://www.jadeworld.com/jade/index.htm">http://www.jadeworld.com/jade/index.htm</a></li> <li><a href="http://sourceforge.net/projects/zeusagent/">http://sourceforge.net/projects/zeusagent/</a></li> <li><a href="http://agentbuilder.com/AgentTools/">http://agentbuilder.com/AgentTools/</a></li> </ul>

X. Facilities required for teaching and learning

<p>List the facilities required</p> <ul style="list-style-type: none"> <li>Data Show</li> <li>Computer Lab</li> <li>MAS Platforms</li> </ul>
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Course coordinator: [Prof. Reem Bahgat]

Head of Department: Prof. Abeer El Korany

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