Course Specifications

Course Title:	Multi-Agent Systems
Course Code:	AI 421
Program:	**Information and Computer Science**
Department:	**Computer Science and Information**
College:	College of Science in Zulfi
Institution:	Majmaah University

Table of Contents

A. Course Identification

1. Credit hours:3
2. Course type **a.** University ☐ College ☐ Department ☐ Others ☐ **b.** Required ☐ Elective ☒
3. Level/year at which this course is offered:
4. Pre-requisites for this course (if any)**:** Logic Programming and Symbolic Computation – AI 323
5. Co-requisites for this course (if any)**:** None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	48	80%
2	**Blended**	6	10%
3	**E-learning**	6	10%
4	**Correspondence**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	
4	**Others** (specify)	
	Total	60
Other Learning Hours*		
1	**Study**	30
2	**Assignments**	30
3	**Library**	20
4	**Projects/Research Essays/Theses**	20
5	**Others** (specify)	
	Total	100%

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course gives you an introduction to systems with multiple agents, units, robots that mutually depend on each other's behaviors in order to evaluate own or collective system performance. The course will cover theory for strategic interaction between self-interested agents as well as more altruistic agents working explicitly together in complex distributed environments. Game theory and swarm intelligence will be central parts of the course curriculum.

2. Course Main Objective

1. To introduce the student to the concept of an agent and multi-agent systems, and the main applications for which they are appropriate
2. To introduce the main issues surrounding the design of intelligent agents
3. To introduce the main issues surrounding the design of a multi-agent society

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Understand the notion of an agent, how agents are distinct from other software paradigms (eg objects) and understand the characteristics of applications that lend themselves to an agent-oriented solution	K3-AI
1.2	Understand the key issues associated with constructing agents capable of intelligent autonomous action, and the main approaches taken to developing such agents	
2	**Skills :**	
2.1	Understand the key issues in designing societies of agents that can effectively cooperate in order to solve problems, including an understanding of the key types of multi-agent interactions possible in such systems	S3-AI
2.2	Understand the main application areas of agent-based solutions, and be able to develop a meaningful agent-based system using a contemporary agent development platform.	
3	**Competence:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**Introduction:** what is an agent?: agents and objects; agents and expert systems; agents and distributed systems; typical application areas for agent systems.	4
2	**Intelligent Agents:** the design of intelligent agents - reasoning agents (eg AgentO), agents as reactive systems (eg subsumption architecture); hybrid agents (eg PRS); layered agents (eg Interrap) a contemporary (Java-based) framework for programming agents (eg the Jack language, the JAM! system).	12
3	**Multi-Agent Systems:** Classifying multi-agent interactions - cooperative versus non-cooperative; zero-sum and other interactions; what is cooperation? how cooperation occurs - the Prisoner's dilemma and Axelrod's experiments; Interactions between self-interested agents: auctions & voting systems: negotiation; Interactions between benevolent agents: cooperative distributed problem solving (CDPS), partial global planning; coherence and coordination; Interaction languages and protocols: speech acts, KQML/KIF, the FIPA framework.	24
4	**Advanced topics:** One issue selected from the contemporary research literature by class instructor.	12
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Understand the notion of an agent, how agents are distinct from other software paradigms (eg objects) and understand the characteristics of applications that lend themselves to an agent-oriented solution	Lectures. Case studies	Written Exam Homework assignments Quizzes
1.2	Understand the key issues associated with constructing agents capable of intelligent autonomous action, and the main approaches taken to developing such agents		
2.0	**Skills**		
2.1	Understand the key issues in designing societies of agents that can effectively cooperate in order to solve problems, including an understanding of the key types of multi-agent interactions possible in such systems	Lectures. Lab Case studies. Individual presentations. Brainstorming.	Written Exam Homework assignments Lab assignments Class Activities Quizzes

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.2	Understand the main application areas of agent-based solutions, and be able to develop a meaningful agent-based system using a contemporary agent development platform.		
…			
3.0	**Competence**		
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	First written mid-term exam	6	15%
2	Second written mid-term exam 12	12	15%
3	Group Project	14	10%
4	Homework assignments	After every chapter	10%
5	Practical exam	15	10%
6	Final written exam	16	40%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

1. 6-office hours per week in the lecturer schedule.
2. The contact with students by e-mail , mobile, office telephone and website.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	G Weiss, Multi-Agent Systems, MIT, 2013
Essential References Materials	Michael Wooldridge, An Introduction to MultiAgent Systems - Second Edition. (Wiley, 2009) Wiley
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	_ Class Rooms _ Computer Labs _ Library
Technology Resources (AV, data show, Smart Board, software, etc.)	Smart Board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Analysis of students' results.	Teaching Staff	Direct
Observation during work	Teaching Staff	Indirect
Students' evaluations.	Teaching Staff	Direct
Colleagues' evaluations.	Peer Reviewer	Indirect
Evaluation questionnaire filled by the students.	Students	Indirect
Interview a sample of students enrolled in the course to take their opinions.	The head of department	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	