Dept Number	CS 539	Course Title	Agents and Multiagent Systems
Semester Hours	3	Course Coordinator	
Catalog Description	This is an advanced treatment of fundamental concepts in the design of intelligent autonomous agents and agent systems. Classic agent theories, architectures, algorithms, and languages are discussed. An agent-based project is an integral part of this course.		

Textbooks

Fundamentals of Multiagent Systems, Jose Vidal, 2007

References

- K. Sycara, Multiagent Systems, AI 19 (2): Summer 1998, 1998, 79-92.
- Les Gasser and K. Kakugawa, MACE3J: Fast Flexible Distributed Simulation of Large, Large-Grain Multi-Agent Systems, In Proceedings of AAMAS-2002.
- M. J. Wooldridge and N. R. Jennings, "Software Engineering with Agents: Pitfalls and Pratfalls", IEEE Internet Computing 3 (3) 20-27, 1999.
- C. Sierra, N. Jennings, P. Noriega, S. Parsons (1998) "A framework for argumentation-based negotiation" in Intelligent Agents IV, M. P. Singh, A. Rao, and M. J. Wooldridge (eds.), Springer Verlag.
- J. S. Sichman and Y. Demazeau. Multi-Agent Systems Social Reasoning, in ICMASS 2000.
- T. Finin, R. Fritzson, D. McKay, R. McEntire (1994). "KQML as an Agent Communication Language", in Proceedings of the Third International Conference on Information and Knowledge Management, ACM Press.
- E. Durfee, (1991). Partial Global Planning: A Coordination framework for Distributed Hypothesis Formation, IEEE-SMC 21 (5).
- C. Harrison, D. Chess, A. Kershenbaum, 1995. Mobile Agents: Are they a good idea? , IBM Technical Report, online at: http://www.research.ibm.com/massive/mobag.ps

Course Learning Outcomes

- An understanding of the "agent" perspective on computational systems.
- The ability to analyze distributed systems in terms of key concepts such as openness, decentralization, autonomy, and organization.
- A sense for the need to integrate multiple AI techniques when constructing intelligent agents.
- The skills to design automation solutions using multiagent system techniques and agent frameworks.

Assessment of the Contribution to Program Outcomes

Outcome →	1	2	3	4	5	6	7	8	9	10
Assessed →										

Prerequisites by Topic

Restricted to graduate standing or consent of instructor.

Major Topics Covered in the Course

1. Introduction

   History: DAI, agents, MAS, system science, etc.

   Agents: AI agents, intelligence, rationality, autonomy, adaptivity, etc.

   Agent and system classifications: homogeneous vs. heterogeneous, Cooperative vs. self-interested, closed vs. open, etc.

   Examples applications {6 classes}

2. Agent Models and Architectures

   Reactive vs. deliberative agents

   Decision theoretic (rational and bounded rational agents)

   First order logic and deductive agents

   Modal epistemic logic (mental states, intentional stance, introspection)

   BDI model and PRS

   Process calculi {4 classes}

3. Distributed Problem Solving

   Problem/task decomposition and allocation (e.g., contract net)

   Task/result sharing

   Coordination methods/mechanisms: multi-agent plans, GPGP, DEC-MDP, etc.

   Distributed planning {5 classes}

4. Multi-Agent Interactions (self-interested agents)

   Game theory: pareto optimality, etc.

   Auctions and bidding schemes

   Voting schemes

   Market schemes

   Coalition formation

   Negotiation and conflict resolution {9 classes}

5. Inter-Agent Communication

   Agent languages: KQML, FIPA-ACL, etc.

   Ontologies

   Speech acts {3 classes}

6. Mobility and Open Systems
   Mobile agents
   Directory agents
   Services and experts
   Softbots and personal assistant agents {7 classes}
7. Organizations and Societies
   Social and organizational structure
   Artificial societies
   Trust, reputation, commitment, etc. {2 classes}
8. Emergent Behavior
   Biologically-inspired models
   Simulations {2 classes}
   Agent Development and Simulation Frameworks
   JADE, Zeus, NetLogo {2 classes}