Computer Science (COMP) 667

Multiagent Systems (Revision 4)

Status:	Replaced with new revision, see the **course listing** for the current revision
Delivery mode:	**Individualized study online**
Credits:	3
Area of study:	Information Systems
Prerequisites:	This course is written for a graduate or advanced undergraduate student. The student should be comfortable with mathematical notation and basic computer algorithms (e.g., **COMP 272** or **COMP 504**). Students who are concerned about not meeting the prerequisite for this course are encouraged to contact the course coordinator before registering.
Precluded:	None
Faculty:	**Faculty of Science and Technology**
	This is a graduate level course and students need to apply and be approved to one of the graduate programs or as a non-program **School**

Notes:	**of Computing and Information Systems** graduate student in order to take this course. Minimum admission requirements must be met. Undergraduate students who do not meet admission requirements will not normally be permitted to take this course.
Instructor:	**Dr. Fuhua (Oscar) Lin**

Overview

Multiagent systems (MAS) can be defined as loosely coupled networks of problem solvers that interact to solve problems that are beyond the individual capabilities or knowledge of each problem solver. These problem solvers, often called agents, are autonomous and can be heterogeneous in nature.

Research and development in MAS is concerned with the study and construction of a collection of autonomous agents that interact with each other and their environments. The study of such systems goes beyond the study of individual intelligence in its consideration of problem solving with social components.

COMP 667 introduces students to the main topics in the theory and practice of MAS, currently one of the most important and rapidly expanding areas of computer science, having emerged from the study of distributed artificial intelligence (DAI). Multiagent systems have been used as an important means with which to address the development of large and complex information systems (IS) and decision support systems (DSS).

Because game theory is a key tool to master within the field, this course will first introduce the student to the concepts in non-cooperative game theory, covering the normal form and the extensive form. Then, this course covers an interesting and important topic, multiagent learning. Next, we introduce social-choice theory, including voting methods; preference aggregation; mechanism design, which looks at how such preferences can be aggregated by a central designer even when agents are strategic; and protocols for multiagent resource

allocation (auctions). Finally, this course introduces coalitional game theory and its potential applications.

Outline

- Unit 1: Foundations
- Unit 2: Intelligent Agents and Multiagent Systems
- Unit 3: Multiagent Learning
- Unit 4: Social Choice
- Unit 5: Mechanism Design
- Unit 6: Multiagent Resource Allocation
- Unit 7: Coalition Game

Learning outcomes

After completing this course, students will be able to:

- Demonstrate/explain the basic concepts of agent-based approach, non-cooperative game theory, multiagent learning, social choice, mechanism design, auctions, and cooperative game theory;
- Develop business and real-world perspectives of multiagent systems;
- Use software tools to develop and test multiagent systems;
- Be aware of future and current trends in MAS research and applications.

Evaluation

To **receive credit** for COMP 667, you must achieve a cumulative course grade of **B- (70 percent)** or better, and must achieve an average grade of at least 60% on the assignments and 60% on the project. Your cumulative course grade will be based on the following assessment.

Activity	Weight
Assignment 1	20%

Activity	Weight
Assignment 2	20%
Assignment 3	20%
Project	30%
Participation	10%
Total	**100%**

Materials

Digital course materials

Links to the following course materials will be made available in the course:

Shoham, Y. & Leyton-Brown, K. (2009). *Multiagent Systems: Algorithmic, Game-Theoretic, and Logical Foundations*. (**free download**). Cambridge.

References

- Maschler, M., Solan, E., & Zamir, S. (2013). Game Theory, Cambridge University Press.
- Railsback, S.F. & Grimm, V. (2011). *Agent-based and Individual-based Modeling: A Practical Introduction,* Princeton University Press.
- Wilensky, U. & Rand, W. (2015). *An Introduction to Agent-Based Modelling,* MIT Press,
- Michael J. Wooldridge, 2009. *Introduction to Multiagent Systems,* 2nd edition, John Wiley & Sons.
- Vidal, J. (2010). *Fundamentals of Multiagent Systems* [**online textbook**].
- Gerhard Weiss (Ed). (2013). *Multiagent Systems: A Modern Approach to Distributed Artificial Intelligence,* MIT press, ISBN 978-0-262-01889-0.

Special Course Features

COMP 667 will be offered in individual study electronic mode. Individual study is facilitated through a variety of computer-mediated communication options, and can be completed at the student's workplace or home.

Special Note

Students registered in this course will be allowed to take an extension due to the nature of the course activities.

Important links

- **Future Course Offerings**
- **Important Dates and Deadlines**
- **MSc IS Contact Information**

Athabasca University reserves the right to amend course outlines occasionally and without notice. Courses offered by other delivery methods may vary from their individualized study counterparts.

Opened in Revision 4, September 18, 2019

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View **previous revision**