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| **Intelligent Agents** | Code & No: | CS 461 |
| | Credits: | 3 (3, 1, 0) |
| | Pre-requisite: | CS320 |
| | Co-requisite: | |
| | Level: | 9 or 10 |

**Course Description:** One of the core abilities of an intelligent agent is to be able to solve problems. Search is a general-purpose technique for finding solutions to problems. However, these search spaces can be quite large and we need to be able to reduce the size of the search space in order to solve problems in a reasonable amount of time and space. We will be exploring several state-of-the-art techniques for reducing the size of these search spaces. A main theme in this field involves strategic agents where game theory is an important tool. We will be looking at the algorithmic and game-theoretic foundations of multi-agent systems in this course. Applications of multi-agent systems range from negotiation, cooperating robots, market and auction analysis, to security.

**Course Aims:** The students will be able to:

1. explain important challenges of MAS
2. phrase MAS scenarios using the language of game theory
3. understand current research papers in Heuristic Search
4. understand some of the tradeoffs involved in using current techniques to reduce the problem space sizes

**Course Learning Outcomes (CLOs):**

The students will be able to:

1. understand what a multi-agent system (MAS) is and when they are useful
2. be able to apply some well-known distributed optimization algorithms
3. build simple agents and multi-agent systems using basic AI concepts
4. identify or derive equilibria in normal form or extensive form games

| No. | Topics | Weeks | Teaching hours |
|---|---|---|---|

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| **1** | Introduction to Multi-agent System | 1 | 3 |
| **2** | Distributed Optimization Problem | 1 | 3 |
| **3** | Agent Knowledge Representation, Reasoning, and Adaptability | 3 | 9 |
| **4** | Introduction to Game | 1 | 3 |
| **5** | Finding Equilibria in Game | 2 | 6 |
| **6** | Reinforcement Learning | 2 | 6 |
| **7** | Review of Search Techniques | 1 | 3 |
| **8** | Mobile Agents | 2 | 6 |
| **9** | Agent Applications | 1 | 3 |
| | **Total** | **14** | **42** |

**Textbook:**

- An Introduction to Multiagent Systems, Wooldridge, Wiley 2009. ISBN-13: 978-0470519462, ISBN-10: 9780470519462

**Essential References:**

- Artificial Intelligence: a modern approach, Russel & Norvig, Prentice Hall 2015. ISBN-10: 9789332543515, ISBN-13: 978-9332543515