

## ICS 606 / EE 606 - Intelligent Autonomous Agents

**Catalog Description:** The theory, methods, and practical applications of autonomous agent systems, including common applications of both software and hardware (robotic) agents. Gain an in-depth practical experience with autonomous agents through programming assignments and projects. 3 credits.

**Overview:** Intelligent autonomous agents are now being used in a broad range of areas from telecommunications, to education, defense and manufacturing. This course focuses on the conceptual basis of intelligent agents, including the theory, implementation, and practical applications of agent systems.

**Course Objectives:** A student should understand (i) the fundamental concepts of agent systems, e.g. logics, reasoning methods, and complexity analysis, (ii) the principles of designing agent systems as complex distributed software systems, and (iii) gain experience with agent programs in different application areas. A student should be able to decide if a non-trivial problem can be solved effectively with the agent paradigm, and if so, design and manage/implement an agent-based solution.

**Prerequisites:** ICS313 or EE467, or instructor consent. A knowledge of artificial intelligence is useful, but not required.

**Textbooks:** Required: Multiagent Systems: A Modern Approach to Distributed Artificial Intelligence, Edited by Gerhard Weiss. The MIT Press, Hardcover March 1999, ISBN: 0262731312, or Paperback July 2000, ISBN: 0262731312. Optional text #1: Artificial Intelligence - A Modern Approach, 2nd edition, Russell and Norvig, 2003, Prentice Hall. Optional text #2: An Introduction to MultiAgent Systems, M. Wooldridge, John Wiley, West Sussex, England, 2002. ISBN: 0-471-49691-X. Selected papers from journals (e.g. Autonomous Agents and Multi-Agent Systems) and conferences (e.g. Autonomous Agents, IJCAI, ECAI, AAI).

**Term Project:** The term project can be a literature review or a programming project. The programming project includes the development (or modification), testing, and evaluation of one or more software or hardware agent systems in an application area of your choice. All projects require a written proposal, progress report including references used, a final report, and a final presentation in class.

**Grading:** Grades are based on the completion of programming assignments (20%), one written midterm examination (30%), presentation of research papers in class and participation in class discussions (20%) and completion of a term project, including written reports and a final presentation (30%).

**Instructor:** Prof. Nancy Reed, nreed@hawaii.edu, Office: 303B POST.

### Topic Outline:

- Introduction to Intelligent Autonomous Agents (2 hours)
- Multiagent Systems and Societies of Agents (4 hours)
- Industrial and Practical Applications (2 hours)
- Distributed Problem Solving and Planning (6 hours)
- Search Algorithms for Agents (4 hours)
- Learning in Multi-agent Systems (4 hours)
- Logic-Based Representation and Reasoning (2 hours)
- Multiagent interaction, communication and cooperation (4 hours)
- Methodologies for designing agent systems (6 hours)
- Agent applications (6 hours)
- Adjustable autonomy and applications (2 hours)