# CS378: Autonomous Multiagent Systems — Fall 2002 Syllabus

**Instructor: Peter Stone**
Department of Computer Sciences

Tuesday, Thursday 2–3:30pm
ENS 145
`www.cs.utexas.edu/~pstone/Courses/378fall02`

**Note:** *This syllabus is subject to change. For complete and up-to-date class information, please monitor the web site.*

## Instructor Contact Information

**office hours:** Tuesday, Thursday 12:45pm–1:45pm, and by appointment
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## Teaching Assistant

**Vinay Sampath Kumar**
**office hours:** Monday 2:00pm–3:30pm, Friday 9:00am–10:30am
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## Prerequisites

Some background in artificial intelligence is recommended. Good programming skills, preferably in C++.

## Text

*An Introduction to Multiagent Systems* by Michael Wooldridge. In addition, many on-line research articles will be assigned and linked to the class website.

## Mailing List

Please subscribe to the class mailing list by following the directions at `http://www.utexas.edu/its/mailinglists/`. The listname is `cs378-pstone-fall02`. Once you have subscribed to the list, you can send mail to the class at `cs378-pstone-fall02@lists.cc.utexas.edu`. Important class information may be sent to this list. It is the student's responsibility to be subscribed.

## Overview

There is no generally accepted definition of artificial intelligence "agents." But practitioners know them when they see them. In loose terms, agents are programs that (i) sense their environment, (ii) make decisions about how to act based on these sensations, and (iii) then execute these actions. Autonomous agents do all three of these steps on their own, i.e. without a human in the loop. Multiagent systems are collections of multiple agents that interact with one another.

This course provides a broad introduction to autonomous agents with an emphasis on multiagent systems. It is a programming-intensive course. There will be on-going, incremental programming assignments leading to a final project, and ultimately a competition tournament in the RoboCup soccer simulator. Students will have the option of working in groups on the final project.

The course also has a significant writing component. Brief written answers to questions based on the reading will be assigned weekly. There will be a project proposal halfway through the semester with an opportunity for revisions. The grade for the final project will be based largely on the written report due at the end of the semester.

Participation in the class discussions will also form a significant part of the grade. Class meetings will consist of discussions based on assigned readings. Each student will be responsible for participating in moderating one discussion.

## Philosophy and Goal

The goal of this course is to give the student an appreciation for the broad research topics currently being pursued in the field of autonomous agents and multiagent systems. By the end of the course, the student should be able to

- Identify and discuss the characteristics of agent-based systems; and
- Program actual agents in one multiagent environment.

The course is designed to include key activities engaged in by researchers, including generation of ideas and programs, critical oral discussion of ideas, and written evaluation and presentation of ideas.

The course **will** be difficult and time-consuming. But it should also be rewarding and a lot of fun. It is designed to present a solid entry point to the field of artificial intelligence. For those students with interest, it could possibly lead to subsequent research opportunities.

## Course Requirements

**Written responses to readings-based questions (15%):** Weekly readings will be posted on the class website on Tuesday to be due the following Tuesday. Associated with most readings will be questions that should be answered with brief, well-thought-out, coherent written responses by email to the instructor and the TA. These responses will be graded on a 10-point scale and graded mostly on written expression and coherence of argument (most questions will not have a "right" answer). Answers will be due by noon on Tuesday. Responses received between then and noon on Thursday will be deducted 2 points (for a maximum score of 8). Responses received after that will be deducted 4 points (for a maximum score of 6).

These deadlines are designed both to encourage you to do the readings before class and also to allow us to incorporate some of your responses into the class discussions.

**Class participation (20%):** As a discussion-oriented course, it is important that you be in class and actively participate in the discussions. Every student will be asked to moderate one discussion based on the readings for that week. Your goal for the discussion will be to have it last as long as possible. Good ways to do that are:

- Make a controversial statement and prepare to defend it; or

- Pose an interesting question and prepare to take either side (in case everyone in the class takes one side or the other).

Candidate discussion topics will be due at 9am the day before they are to be presented (i.e. Monday or Wednesday). You will then discuss and revise them with the instructor and/or TA.

**Initial programming assignments (15%):** A series of 4 incremental programming assignments will be assigned during the first half of the semester. Their purpose is to familiarize you with the software you will be using in the final project and to give you direct experience with some of the concepts covered in the readings.

**Project proposal draft (5%):** Midway through the semester, you will propose a topic for your final project. The proposal will be in written form and should be roughly 5 double-spaced pages. You may propose to work with one other student on the final project (more will be expected from 2-person teams), but each student must turn in an independently-written proposal and final report. The draft will be evaluated primarily on written expression and coherence of argument. Feedback will be given both on writing and content.

**Project proposal revision (15%):** A revision of the project proposal should take into account both types of comments given on the draft. Expect it to require significant rewriting, as opposed to just editing of the proposal. It will be graded primarily on written expression and coherence of argument. Feedback will be given on content.

**Final programming project (competition) and report (30%):** In most cases, the culminating assignment for the course will be a full-fledged robotic soccer team for entry in a class tournament. Other options will be possible if agreed upon at proposal time. The grade for the final project will be based upon the final product (program) and the written report, which should detail what was done and relate it to the class readings. The grade will **not** be tied to performance in the tournament.

## Extension Policy

If you turn in your assignment late, expect points to be deducted. No exceptions will be made for the written responses to readings-based questions (subject to the "notice about missed work due to religious holy days" below). For other assignments, extensions will be considered on a case-by-case basis, but in most cases they will not be granted.

## Academic Dishonesty Policy

You are encouraged to discuss assignments with classmates. But all written work must be your own. And programming assignments must be your own except for 2-person teams on the final project. Students caught cheating will automatically fail the course.

## Schedule (tentative)

| Week | Dates | Topic |
|---|---|---|
| 1 | 8/29 | Introduction |
| 2 | 9/3,5 | Autonomous agents |
| | | **programming assignment 1 due Thursday** |
| 3 | 9/10,12 | Agent architectures |
| | | **programming assignment 2 due Thursday** |
| 4 | 9/17,19 | Multiagent systems |
| 5 | 9/24,26 | Agent communication |
| | | **programming assignment 3 due Thursday** |
| 6 | 10/1,3 | Teamwork |
| 7 | 10/8,10 | RoboCup case studies |
| | | **programming assignment 4 due Thursday** |
| 8 | 10/15,17 | Swarms and self-organization |
| | | **project proposal draft due Thursday** |
| 9 | 10/22,24 | Applications: cooperative information gathering and industrial settings |
| 10 | 10/29,31 | Distributed rational decision making |
| | | **project proposal revision due Thursday** |
| 11 | 11/5,7 | Distributed rational decision making |
| 12 | 11/12,14 | Negotiation and auctions |
| 13 | 11/19,21 | Agent modeling |
| 14 | 11/26 | Multiagent learning |
| 15 | 12/3,5 | Entertainment Agents |
| | | **final project and report due Thursday** |
| Final | 12/17 (10am–noon) | **final tournament** (no exam, nothing due) |

## Notice about students with disabilities

The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. To determine if you qualify, please contact the Dean of Students at 471-6529; 471-4641 TTY. If they certify your needs, I will work with you to make appropriate arrangements.

## Notice about missed work due to religious holy days

A student who misses an examination, work assignment, or other project due to the observance of a religious holy day will be given an opportunity to complete the work missed within a reasonable time after the absence, provided that he or she has properly notified the instructor. It is the policy of the University of Texas at Austin that the student must notify the instructor at least fourteen days prior to the classes scheduled on dates he or she will be absent to observe a religious holy day. For religious holy days that fall within the first two weeks of the semester, the notice should be given on the first day of the semester. The student will not be penalized for these excused absences, but the instructor may appropriately respond if the student fails to complete satisfactorily the missed assignment or examination within a reasonable time after the excused absence.