Computer Science 383
Multi-Agent and Robotic Systems

Course Outline

Lecture: Alden 101, MWF 1:30pm to 2:20pm
Lab: Alden 101, Tuesday 2:30pm to 4:20pm


Instructor: Janyl Jumadinova
Office: Alden Room 105
Office phone: 814-332-2881
Email: jjumadinova@allegheny.edu
Office hours: Monday, Wednesday, Friday: 2:30pm-4:30pm,
Thursday: 11:30am-1pm and by appointment

To schedule a meeting with me during my office hours, please go to [http://cs.allegheny.edu/sites/jjumadinova/schedule.html](http://cs.allegheny.edu/sites/jjumadinova/schedule.html), click on “Schedule an Appointment...” and select the desirable date and time. You can schedule an appointment outside of my office hours by email.

Textbook:

Most of the content for this class will come directly from me. We will be using material from multiple books on multi-agent and multi-robot systems available online.

The course:

A study of autonomous software agent and robotic systems and the principles, design, and implementation underlying such systems. Students explore how to design societies of agents and robots and how to monitor and control their operation. Unique challenges in this field and the wide range of existing solutions are examined. Topics include communication, coordination, and cooperation of software agents and robots from a variety of perspectives that include cognitive science, decision-theory, game-theory, machine learning, and software-engineering. Students are required to develop and evaluate several real multi-agent or multi-robot systems.

Prerequisites: CMPSC 111
The course page on Sakai will be used for announcements, and for reporting student grades. We will use the bitbucket repository for delivering material to you and for getting assignments from you.

Course Goals:

- Understand modeling of multi-agent and robotic systems including the dynamics and interconnections between them.
- Gain practice with using various multi-agent software and robotic hardware tools.
- Learn applications of various multi-agent and multi-robot systems.
- Be able to design a multi-agent and a multi-robot system using the programming experience from the previous course(s) and from the material presented in this course.

Grading:

The grade in this class is based on the following categories.

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Class Participation</td>
<td>10%</td>
</tr>
<tr>
<td>Assignments</td>
<td>45%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>15%</td>
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<tr>
<td>Final Project</td>
<td>30%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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These grading categories are defined as follows:

- **Class Participation**: All students are required to actively participate during all of the class sessions. Your participation will involve participating in class exercises and discussions, and asking constructive questions of the other members of the class during discussions and presentations.

- **Assignments**: There will be three types of assignments.
  - Laboratory assignments invite students to experiment with various tools and techniques for designing, implementing, evaluating, and documenting your multi-agent or robotic system. To best ensure that students are ready to develop software after graduation, students will complete most of the lab assignments in teams. Many of the lab assignments in this course will expect students to give both a presentation and a demonstration of the system that they created.
Homework Assignments will give students an opportunity to enhance their understanding of the theoretical material covered during class meetings. These written homework assignments must be done individually; no collaboration or sharing of answers is allowed. Your discussions with others about homework problems must be at a “high” level, dealing with general issues rather than details specific to a particular answer.

Research paper presentations will allow students to survey the state-of-the-art research on the topic of multi-agent and multi-robot systems and share their findings with their colleagues in the course.

- **Quizzes**: The quizzes will cover all of the material in its associated module. The date for each quiz will be announced at least one week in advance of the scheduled date, tentatively three quizzes are planned. Unless prior arrangements are made with me, all students will be expected to take the quizzes on the scheduled dates.

- **Final Project**: The final project in this class will require you to apply all of the knowledge and skills that you have accumulated during the course of your study to implement a complete multi-agent or a multi-robot system. The specific details of this task will be given at the end of February.

**Community-based Component**

Some of the assignments will require you to develop software to be presented to a group of students in the Crawford Central school district. The dates of these presentations are as follows:

- February 9 at 1:30pm (during the class period): First District Elementary (6th graders)
- February 19 at 6pm: Third Thursday - optional (extra credit)
- March 2 at 1:30pm (during the class period): First District Elementary (6th graders)
- March 30 at 1:30pm (during the class period): First District Elementary (6th graders)

For the presentations at the First District Elementary school, the class will be divided into three groups and only one group will be going to present at a time. If you have a preference for a specific date from the given dates, please let me know.
Also, as a part of this course, we will be developing activities for a Third Thursday, that invites families from Crawford Central school district to actively participate in activities that encourage reading, math, and science literacy. Although, you will develop a set of activities for this event as a part of one of your lab assignments, your participation during the actual event is optional.

There maybe other presentations you will give to the community on the multi-agent and multi-robot systems that you develop as a part of your assignments.

Assignment Submission:

All assignments will have a stated due date and are to be turned in electronically on that due date. You must follow proper procedures for submitting your completed programs in order for them to be graded. You will be given instructions on how to do that with your first programming assignment.

Late assignments will be accepted for up to one week past the assigned due date with a 15% penalty. All of the late assignments must be submitted at the beginning of the session that is scheduled one week after the due date. Unless special arrangements are made with the course instructor, no assignments will be accepted after the late deadline. For any assignment completed in a group, students must also turn in a one-page document that describes each group member’s contribution to the submitted deliverables.

Attendance:

It is mandatory for all students in this course to attend all class and laboratory sessions. The student must notify me of a legitimate absence ahead of the time. Frequent or prolonged absences due to illness should be documented by the student’s doctor, the Health Center, the Dean of Students’ Office, or the office of Student Disability Services. If you need to miss class due to a religious observance, please speak to me in advance to make arrangements to cover material from that day. Students who miss more than five classes or lab sessions without a legitimate excuse will have their final grade in the course reduced by one letter grade in addition to any reduction due to missed work.

A Note on extenuating circumstances
If you should find yourself in difficult circumstances that significantly interfere with your ability to prepare for this class and to complete assignments, please inform me immediately so that we can work something out together! Do not wait until the last day of class to ask for exceptions to what is stated
in this syllabus. In such a situation, you may also find it helpful to contact the campus Counseling Center (332-4368) in 304 Reis Hall, which is open from 8-5 but also has a 24 hour hotline.

**Use of Laboratory Facilities and Robotic Hardware:**
Throughout the semester, we will experiment with different software tools that are used in multi-agent and robotic systems. These software tools will be configured and provided for you on the department’s laboratory computers. Students are encouraged to complete all assignments and the final project while using the department’s laboratory facilities. The course instructor and the systems administrator do not assist students in configuring their personal computers. You will also use various robotic hardware, including Lego robots, in this course. The students will be assigned various hardware components for specific assignments and students will be responsible for the assigned hardware over the duration of the given assignments.

**Special Needs and Disability:**
Students with disabilities who believe they may need accommodations in this class are encouraged to contact Disability Services at (814) 332-2898. Disability Services is part of the Learning Commons and is located in Pelletier Library. Please do this as soon as possible to ensure that approved accommodations are implemented in a timely fashion.

**Honor Code:**
All students enrolled at Allegheny College are bound by the Honor Code. It is expected that your behavior will reflect that commitment. To this end, we expect that you will adhere to the following Department Policy:

**Department of Computer Science Honor Code Policy**

It is recognized that an important part of the learning process in any course, and particularly in computer science, derives from thoughtful discussions with teachers, student assistants, and fellow students. Such dialogue is encouraged. However, it is necessary to distinguish carefully between the student who discusses the principles underlying a problem with others, and the student who produces assignments that are identical to, or merely variations on, someone else’s work. It will therefore be understood that all assignments submitted to faculty of the Department of Computer Science are to be the original work of the student submitting the assignment, and should be signed in accordance with the provisions of the Honor Code. Appropriate action will be taken when assignments give evidence that they were derived from the work of others.

You are encouraged to periodically review the specifics of the Honor Code as stated in the College Catalogue, The Compass, and elsewhere.