91.548 Robot Design, Spring 2015
Syllabus

Contact Information

Prof. Holly Yanco
Olsen 206
holly@cs.uml.edu (best way to reach me)
978-934-3642

Web


Class Meetings

Tuesdays, 4:00-6:30, Olsen 402

Office Hours

Tuesdays 9:00 to 10:30
Thursdays 12:30 to 2:00
and by appointment

Course Description

In this course, we will study the field of robotics from the perspective of designing a robot system. Students will work in teams to choose an application domain and a problem to solve, then will select parts for their robots given a budget. After the project proposals are submitted and parts are ordered, teams will work together to build and program their robot systems. Guest lectures from several roboticists will highlight the design process in several application domains, ranging from commercial growers to all-terrain tracked robots to telepresence robots.

The course will draw upon research papers (both recent and historical) for learning about these topics. Each week, you will be assigned 2-3 research papers on a particular topic to read. These papers will form the basis for class discussion of the topic.

Readings

There is no textbook for the course. Readings will be distributed in hard copy at class and also posted to the course website (if an electronic version exists).

Course Requirements

Written Discussions of the Readings

Each week, you must turn in a written discussion of each of the papers for that week (one page per research paper; can be a bit longer, if necessary). In this discussion, you should briefly summarize the paper (no more than two or three sentences), then discuss the pros and cons of the paper’s approach (the
work described, not the font or writing style). You should also list at least three issues that you would like to discuss about the paper; these issues could be in the form of questions, if you’d prefer. These summaries must be original work and should include citations if you take any material from other sources.

Assignments:  
There will be assignments distributed every 1-2 weeks.

Projects:  
The bulk of the course’s work will be spent designing, building and programming a robot system together with a team from the class. This project will be a major undertaking and one that you should expect to spent at least 4-6 hours each week outside of class working on.

Grading Policy

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written discussions</td>
<td>35%</td>
</tr>
<tr>
<td>Class discussion</td>
<td>10%</td>
</tr>
<tr>
<td>Assignments</td>
<td>15%</td>
</tr>
<tr>
<td>Project</td>
<td>40%</td>
</tr>
</tbody>
</table>

Collaboration Policy

You should write your paper discussions and assignments on your own. You can discuss these assignments with your classmates, but any work that you turn in must be your own.

I encourage you to work in teams for the robot building project. If you feel that you need to work alone, please talk to me.

Homework Policy

All work must be turned in at the start of class on the date it is due in order to receive credit.

Lab

The lab is in Olsen 302. The door has an ID lock, so you will have 24 hour access to the lab (ID access should be live by Thursday 1/23). While some time in class is set aside for working on your robot, you should expect to spend additional time in the lab to work on your project.

Please try to keep your workspace and the lab neat. Do not leave trash lying around. You may eat in the lab, but this policy will be changed if people do not clean up after themselves.

This semester, the lab is shared with 91.450 Robotics I. Both classes will be given storage areas and should keep the lab clean for one another.
Schedule

T  1/20  Course introduction
    A brief history of robots
    Guest lecture: Introduction to ROS, Eric McCann, UMass Lowell

T  1/27  Examples of the iterative design process
    Guest lecture on robot design: Joe Jones, Harvest Automation

T  2/3   Design heuristics
    Guest lecture on robot design: Arnis Mangolds, C2I Inc.

T  2/10  Robot morphology and its relation to application domains
    Guest lecture on robot design: James Dalphond, UMass Lowell

T  2/17  No class: Monday schedule

T  2/24  Hardware: Processors, motors, and sensors
    Student presentations: Cool robot applications
    **Project brainstorming**

T  3/3   3D printing and laser cutting
    Guest lecture on robot design: Adam Norton, UML NERVE Center

T  3/10  Autonomy and robot architectures
    Guest lecture: ROS for Arduino, Eric McCann, UMass Lowell
    **Project proposals, with parts lists, due**

T  3/17  No class: Spring Break

T  3/24  Human-robot interaction
    Project work in lab

F  3/27  Botball set up (volunteer opportunity)

S  3/28  Botball tournament and Botfest exhibition (volunteer opportunity)

T  3/31  Evaluating robot systems
    Project work in lab

T  4/7   Space robotics
    Project work in lab

W  4/8   NERVE Open House (optional attendance, demo possibility if your robot is ready in some form), 6-8pm, 1001 Pawtucket Boulevard

T  4/14  **Mid-project presentations**
    Project work in lab

T  4/21  Future of robotics
    Project work in lab

T  4/28  **Project presentations and demonstrations**

M  5/4   **Project reports due by noon**, either under Olsen 206 door or via email