COMP 4510, Mobile Robotics II, Fall 2019
Syllabus

Course Staff

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Course Web Page

http://www.cs.uml.edu/~holly/teaching/4510/fall2019/

Course Meetings

Tuesdays and Thursdays 9:30-10:45
We will meet either in Olsen 335 or Dandeneau 407; see schedule on last page

Professor's Office Hours

Mondays	1:00	to	2:00	Dandeneau 315
Tuesdays	11:00	to	1:00	Dandeneau 315

and by appointment

TA's Office Hours

Tuesdays	2:00	to	5:00	Dandeneau 407
Wednesdays	2:00	to	4:00	Dandeneau 407

Note: Victoria also takes classes and has research to do. When she is working in the HRI Lab next door to the teaching lab, please do not disturb her.

Course Description

In this course, we will study the field of robotics from the perspective of designing a robot system, through a series of lectures, readings, and lab-based projects. Topics include sensors, locomotion, autonomy, control architectures, application domains, and current research. (See the schedule at the end of this syllabus for a full list.) Guest lectures from several roboticists will highlight the design process in several application domains.

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.

You will design, build and program a robot for a competition (restricted design constraints) and a final project (less restricted constraints). A public demonstration of the final projects will be held at the end of the term.

Course Outcomes

This course fulfills the Applied and Integrated Learning (AIL) and Information Literacy (IL) Essential Learning Outcomes (ELO)

At the completion of this course, students will be able to:

1. Work in teams to design, build, program, and test robot systems for a variety of tasks (ABET 3b, 3c, 3d, 3i).

2. Identify and utilize the sensors and programming strategies needed to solve problems in robotics (ABET 3a, 3b, 3i).
3. Understand open problems in robotics and ways that such problems could be solved (ABET 3b, 3h).
4. Demonstrate and describe their work in a public setting (ABET 3f).
5. Identify and discuss ethical issues in the area of robotics and society (ABET 3e, 3g).

Readings and Responses

There is no textbook for the course. Readings will be distributed in class. Many will not be available on the course web site due to copyright issues. If you miss a class, you are responsible for getting a copy of the handout from a classmate or from me during office hours.

For the distributed readings, you will prepare a written discussion of each of the papers for that week (one page per reading; 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. A sample summary will be discussed in class before the first readings.

Due Date Policy

All work must be turned in at the start of class on the date it is due in order to receive full credit. Work will be accepted by the start of the following class for 50% credit. If you are having trouble keeping up with the work, please talk to me.

Grading

Assignments and Labs	30%
Midterm Exam	20%
Competition Project	20%
Final Project	30%

Collaboration Policy

Depending up on the class size, labs will be done either individually or in groups of two students each. If we need to have groups of two, you may choose your own partners, but I reserve the right to regroup people as the term progresses. In the case of paired work, I expect that each person will do their own equal share of the work. To learn, you'll need to actually build and program the robots, not watch another person do it.

You should write your own assignments as well as any written components of the labs. You may discuss the questions with your classmates, but you must write them up individually. Exams are also to be an individual proposition.

Robots

In the lab, you'll be building and programming robots. We will be using the Wallaby robot controller. Our robot bases will be built out of Lego (and anything else you'd like). Each group (one or two people) will be given a robot kit with the

processing boards, sensors, and motors for use during the term; the lab contains large bins of Lego as well as a variety of other parts such as Vex and K'Nex. You may also choose to 3D print or laser cut parts for your robot.

Lab

The lab is in Dandeneau 407. Note that the lab is shared this semester with other courses and it is also used by the Robotics Club (which you can join), so desks must be left clear and ready for anyone to use. When you are not working in the lab, you should put your robot and parts in the box provided to you and then put the box on the storage rack.

The lab's door has an ID lock, so you will have 24 hour access (ID access should be live before the first time we go to the lab on 9/17). 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 labs and project. When other classes are meeting, it will not available for use; these times will be announced using the class Google Group.

Please keep your workspace and the lab neat. Do not leave trash lying around, on tables or the floor. You may eat in the lab, but this policy will be changed if people do not clean up after themselves. Please throw food trash away in the hallway, not in the room, as the trash is not emptied often in the room.

Schedule

Th	9/5	Class overview; brief history of robotics – OLS 335
F	9/6	Analog Devices Sensor Fusion Challenge presentation, 12-1pm – UCC 158, optional. (Pizza will be served.)
T	9/10	Robot morphologies and drive mechanisms – OLS 335
Th	9/12	Robot sensors, designing a sensor suite and sensor fusion – OLS 335
F	9/13	Panasonic 3D LIDAR Challenge presentation, 12-1pm – UCC 490, optional. (Pizza will be served.)
T	9/17	Introduction to the Wallaby kit and the KISS IDE – DAN 407
Th	9/19	Designing robots for competitions – OLS 335
T	9/24	Competition description and design constraints – DAN 407
Th	9/26	DARPA Grand Challenge Video – OLS 335
T	10/1	Autonomy, Braitenberg Vehicles, and Robot architectures – OLS 335
Th	10/3	Designing robots for search and rescue – OLS 335
T	10/8	Competition building with **mid-point check** – DAN 407

Th 10/10 Guest Lecture: Designing Roomba and agricultural robots, Joe Jones, Franklin Robotics – OLS 335

T 10/15 No class – Monday schedule

Th 10/17 Project overview; Designing robots for assistive technology – OLS 335

T 10/22 **Competition** – DAN 407

Th 10/24 **Project idea meetings** in conjunction with a lab session – DAN 407

T 10/29 Evaluating robot systems – OLS 335

Th 10/31 **Project proposal presentations**; **Project proposals due** – OLS 335

T 11/5 **Mid-term Exam** (material up to and including class on 10/29) – OLS 335

Th 11/7 Project Building – DAN 407

T 11/12 Guest Lecture: Designing rugged robots for outdoor use, Arnis Mangolds, C2I Inc. – OLS 335

Th 11/14 Project Building – DAN 407

T 11/19 Human-robot interaction – OLS 335

Th 11/21 Designing social robots – OLS 335

T 11/26 **Project mid-point design presentations** – DAN 407

T 11/28 No class – Thanksgiving

T 12/3 Guest Lecture: Designing human-centered robots, Jason Walker, Waypoint Robotics – OLS 335

Th 12/5 Designing robots for space – OLS 335

T 12/10 Robot ethics – OLS 335

Th 12/12 **Project demos** – DAN 407

T 12/17 **Project reports due** by noon by email

Note: There is no final exam in this project course