COMP.4510 Mobile Robotics II and COMP.5490 Mobile Robotics
Fall 2017

Contact Information

Prof. Holly Yanco, Olsen 206, holly@cs.uml.edu

Class Meetings

Tuesdays and Thursdays, 9:30-10:45, Olsen 402

Office Hours

Mondays 12:00 to 1:30
Tuesdays 11:00 to 12:30
and by appointment.

Course Description

This course will focus on the growing field of probabilistic robotics. We will study the probabilistic theory that allows a robot to build a robust model of the external world, even though it has noisy sensors and inaccurate actuators. We will begin by studying localization (the problem of figuring out a robot's position or "pose") when given a world map. Topics include sensor modeling, hidden Markov models, particle filters, localization, and map making. We'll conclude with understanding the "simultaneous localization and mapping" (SLAM) algorithm, which is the basis of autonomous automobiles and other robotic systems.

The course will focus on discrete methods. Continuous methods will be briefly mentioned when relevant. It is expected that you have already taken Probability and Statistics or that you are currently registered for the course.

The course will have a strong implementation component. The course will also require you to be a self-directed learner, seeking out solutions to only partially-structured problems, and ultimately specifying and carrying out your own final project.

Textbook

Probabilistic Robotics
Sebastian Thrun, Wolfram Burgard, and Dieter Fox
MIT Press, 2006

Course Website

http://www.cs.uml.edu/~holly/teaching/4510and5490/fall2017/

Software

For the course, ROS on virtual machines run by the university. ROS runs on Linux, so you will need to have a strong working knowledge of programming in a *nix environment. Code for the course can be written in C++ or Python.

Core Curriculum 2015 Essential Learning Outcomes

This course will deliver two Core Curriculum 2015 Essential Learning Outcomes (ELOs) in the Computer Science undergraduate degree program: Applied and Integrative Learning (AIL) and Information Literacy (IL).

Applied and Integrative Learning (AIL)

Definition: Applied and Integrative Learning is an understanding and disposition that a student builds across curriculum and co-curriculum, fostering learning between courses or by connecting courses to experiential learning opportunities.

The semester project will require you to set your own challenge based on the concepts learned in this class but also all of your knowledge from your prior courses. You will be expected to reach for something where you don't already know the answer, document your process of investigation, and your conclusions. Thus, you will use your computer science knowledge in an integrative and applied way to accomplish the project.

Information Literacy (IL)

Definition: The ability to use digital technologies, communication tools and/or networks to define a problem or an information need; devise an effective search strategy; identify, locate, and evaluate appropriate sources; and manage, synthesize, use and effectively communicate information ethically and legally.

As part of the semester project, you will do a literature review of related work. The class will provide you with guidance on how to do this. You will describe how this prior work has influenced your planning, and you will describe how your results are related to this prior research. Specifically in the field of computer science, you will learn to conduct literature reviews, and you will learn how to use state-of-the-art research results in interpreting your own original work.

Midterm Exam

The midterm exam will be given in class on ***Thursday, November 9***.

Grading

30% Weekly assignments (problem sets and reading summaries)
30% Midterm and short exams (theory and programming)
40% Project (implementation and final paper)

Graduate vs. Undergraduate section

The graduate section of the course will have a longer paper required for the project and additional reading/problems on weekly assignments.

Collaboration Policy

You must do the homework assignments individually. You may discuss the questions with your classmates, but you should complete the problems on your own, whether on paper or on the computer.

Turning in identical (or nearly identical) code violates the collaboration policy. You may not input code into a single file, then turn it in for more than one person. Coding yourself is the only way to learn how to do it. If you're having trouble, come to my office hours or schedule an appointment, see the TA, or ask a fellow classmate, but learn the material instead of copying it.

It should go without saying that taking solutions from any website, classmate, other person, or old homework assignment is plagiarism, which will be handled as a serious offense, according to University policy. If you use a website or paper as a reference, cite it.

For the final project, teams of two persons will be allowed, or you can do the project on your own. Teams of three will be allowed only with a plan for the work that gives each team member a clear and distinct role.

Homework Policy

Assignments must be turned in at the start of class on their due date in order to receive full credit. (So if you haven't finished the assignment yet, don't skip class to keep working on it. Come to class and finish later.) Assignments may be passed in up until the start of the next scheduled class meeting to receive 50% credit. After the next class meeting, no credit will be received for assignments, since solutions will have been distributed, but you may turn your solutions in to have them read and commented upon.