ECE 387 Intro to Robotic Systems

Sprint 2018 Syllabus

Instructor

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Course Goals and Objectives

Cadets shall:

- Apply forward and inverse kinematic analysis and dynamic analysis to planar manipulators and mobile robots
- Understand mobile robot odometry challenges and the purpose of Kalman Filters
- Understand the principles of operation and characteristics of various robot sensors
- Understand image capture with a CCD camera

Prerequisite Course

Familiarity with any programming language, such as Matlab or C/C++, is all that is required.

Course Materials and Resources

Course Text	None, various PDFs are provided for reading
Web Page	TBD
Software	Python 2.7 will need to be installed on your laptop

Grades

Grade	Grade
$90 < A < 100$	$74 < C+ < 77$
$87 < A- < 90$	$70 < C < 74$
$84 < B+ < 87$	$67 < C- < 70$
$80 < B < 84$	$60 < D < 67$
$77 < B- < 80$	$0 < F < 60$

	Prog Pts	Final Pts
HW	(5)25	(6)30
GRs	100	100
Labs	(2)40	(3)60
Quizzes	(2)20	(2)20
Final Project		100
TOTAL	185	310

Missing Class and the Late Policy

Inform your instructor of absences in advance via email. Please include the reason for the absence and any relevant SCA. Check the SCA to see if instructor permission is required and if it is, make the request prior to the absence. You will be given an Unexcused Absence in CAS if you fail to get permission.

Due to the limited time to conduct labs and the fact they are executed in groups, you can not miss a labs unless you have a medical excuse due to unplanned illness.

If you are expecting to miss class on the day an assignment is due, you shall turn in your assignment prior to your departure. Your instructor may grant a no-penalty turn-in extension for absences resulting from illness or other legitimate extenuating circumstances. Cadets shall coordinate late submittals in advance. The late policy for the Department of Electrical and Computer Engineering is as follows:

How Late?	Max Penalty	Max Grade
$<$ 1 day	25%	75%
2 day	50%	50%
3 day	75%	25%
$>$ 3 day	100%	0%

Collaboration and Documentation Policy

You may receive help from any DFEC faculty member on the homework. Do not work with other students in the class or who have taken the class previously. Document all help received on work submitted for grading IAW DF policies, or *none* if your work was completely individual effort.

Quizzes

Short graded quizzes will be given periodically throughout the semester and are listed in the schedule. The quizzes are based on the previous lessons.

Labs and Final Project

The labs are performed in groups of no more than 3 students. Each lab will build on the homework, in class lectures and readings. The purpose of the labs is to provide hands on experience with the topics discussed in the lectures. The final project will focus on the Roomba robot, controls, computer vision, and path planning.

Schedule

Lsn	Topic	Quiz	Reading	Due
1	Intro & Overview			
2	Linux Command Line			
3	Python Intro			HW1 Command Line
4	Python			HW2 Python
5	Python			HW3 Python
6	Lab 1: linux and python			Lab1 EOC
7	Kinematics: Intro	Y		
8	Forward Kinematics			
9	Inverse Kinematics			HW4 Forward Kinematics
10	Robot Arm Control			
11	Image Processing			HW5 Inverse Kinematics
12	Lab 2: Robot Arm			Pre-Lab2
13	Lab 2: Robot Arm	Y		Lab2 EOC
14	Image Processing			
15	Image Processing			HW6 Image Sources
16	GR 1 (move to 18?)			
17	Computer Vision Intro			
18	CV: Face Detection			
19	CV: Marker Detection			HW7 Face Detection
20	CV: ??			HW8 Marker Detection
21	CV: Kalman Filter	Y		
22	CV: Detection and Tracking			[HW9 Kalman Filtering]
23	Lab 3: Detection and Tracking			Lab3 EOC
24	Mobile Robots			
25	Roomba Overview			
26	Roomba Sensors (HW10 in class)			
27	Roomba Sensors			HW10 Roomba Sensors
28	Roomba Sensors			
29	Lab 3: Sensor Calibration			
30	Controls			
31	Path Planning			Lab4 BOC
32	Path Planning (HW11 in class)			
33	INS			HW11
34	INS			
35	Lab 5: Roomba	Y		
36	Lab 5: Roomba			Lab5 EOC
37	GR2			
38	Final Project			
39	Final Project			
40	Final Project			Final Project

References

- Roomba Setup
- Interfacing Windoze and Linux file systems
- Connecting to the Roomba via wifi
- Laptop software install for python, OpenCV, and MS Compiler
- Pandoc setup for automating website/documentation generation