

# ECE 387 Introduction to Robotic Systems

## Syllabus

### Instructor

Maj Kevin Walchko  
Fairchild 2F48  
kevin.walchko@usafa.edu

### 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 or any student currently enrolled in ECE387. 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	HW	Due
1	Intro & Overview			
2	Linux			
3	Python		1	
4	Python		2	
5	Python		3	
6	Lab 1: linux, git, and python			Lab1 EOC
7	Kinematics: Introduction	Y		
8	Forward Kinematics			
9	Inverse Kinematics			
10	Robot Arm Control		4	
11	Lab 2: Robot Arm		5	
12	Lab 2: Robot Arm	Y		Lab2 EOC
13	Roomba Overview			
14	Roomba Sensors			
15	Roomba Sensors			
16	Roomba Sensors			
17	Lab 3: Sensor Calibration			
18	GR 1			
19	Image Processing			
20	Image Processing		6	Lab3 BOC
21	Image Processing			
22	Computer Vision			
23	Computer Vision		7	
24	Computer Vision			
25	Computer Vision		8	
26	Kalman Filter	Y		
27	Detection and Tracking			
28	Lab 4: Detection and Tracking		9	Lab4 EOC
29	Mobile Robots			
30	Controls			
31	Path Planning		10	
32	Path Planning			
33	INS		11	
34	INS			
35	Lab 5: Roomba	Y		
36	Lab 5: Roomba			Lab5 EOC
37	GR2			
38	Final Project			
39	Final Project			
40	Final Project			