### EECS192 Mechatronic Design Laboratory - Spring 2018 (1/10/2018)

Instructor: Prof. R. Fearing, Office 725 Sutardja Dai Hall, x2-9193.  
Office Hours: Wed 2-300 pm, Thu 2-300pm  
Please email for an appointment at another time (ronf@eecs.berkeley.edu).

TA: Varun Tolani (vtolani@berkeley.edu Office hours (tba) in 204 Cory.  
Class meeting: Tue 5-630 pm 3107 Etcheverry Hall.  
Lab lecture/demo Tentative: Wed 9-10 or Th 11-12, 204 Cory Hall. Checkoffs tentatively Fridays,  
time tbd. At least one team member must be present to demonstrate functionality.

Grading: 15% checkoffs, 20% final exam, 18% oral and written reports, 9% written assignments,  
10% first round contest, 20% second round contest, 3% community points (Piazza, peer review, lab  
helpfulness), 5% in class 10 minute quizzes.

Recommended Texts: (on reserve in Engineering Library)  
*Mechatronics: mechanical system interfacing* by D.M. Auslander;  
*Analytical robotics and mechatronics* by W. Stadler;  
*Robotic engineering: an integrated approach* by R.D. Klafter;  
The Art of Electronics by Horowitz and Hill;  
Suggested reference:  
*Introduction to Mechatronic Design* by J.E. Carryer, R.M. Ohlne, and T.W. Kenny. Please check the class web page: www-inst.eecs.berkeley.edu/~ee192 for class handouts and  
pointers to data sheets, etc. Also, announcements and discussion will be on piazza.

**wk** | **lecture** | **Lecture and Demo Topics** | **Project Checkpoint** |
---|---|---|---|
1 | 1/16 | proj. description, ARM Cortex M4 overview, peripheral intro  
Demo: soldering, ARM Cortex M4, car | team formation |
2 | 1/23 | motors, motor control, CortexM4 IO  
electronic construction practices -caps  
Demo: MCUXpresso, Eagle, test equipment | Hello World, LED blink |
3 | 1/30 | PWM, H Bridge, power MOSFET  
Demo: RC servo, motor circuit and waveforms | written project proposal Fri. Feb. 2  
car clean and checked |
4 | 2/6 | RC servo, CortexM4 PWM, Power Supply I  
Demo: switching power supply waveforms | CPU turns motor on/off (on bench - stalled)  
CPU turns front wheel left/right |
5 | 2/13 | Power Supply II  
Demo: power filtering, PCB peer review | drive motor from battery  
power PCB (date tbd) |
6 | 2/20 | optical encoder, velocity sensing  
Demo: velocity control, speed sensor | motor velocity control |
7 | 2/27 | line sense intro  
Demo: optical line sensing | drop and run test, open loop Figure 8 (PCB on car) w/e-stop  
lab clean |
8 | 3/6 | steering control I, line detection  
Demo: steering control, PID | bench top line following, drop and run |
9 | 3/13 | steering II and velocity control  
Demo: Simulation and embedded programming I | closed loop Figure 8 line following I, drop and run  
(outside track setup)  
assignment #1 due Tues 3/13 |
10 | 3/20 | CT and DT control | velocity control, Figure 8 (> 1 m/sec), sensor mech. response,  
lab clean  
Assignment #2 due Fri. 3/23 |
11 | 3/26 | Spring Break | Spring Break |
12 | 4/3 | feedforward control and filtering  
demo: embedded programming II | practice course and step response  
Progress report due Tues. Apr. 3 |
13 | 4/10 | HW and SW robustness  
Demo: car tuning | Round 1: likely Mon 4/9 |
14 | 4/17 | Mechatronic system examples I | CAL Day Sat April 21 |
15 | 4/24 | Mechatronic system examples II | Round 2: likely Mon 4/23, lab clean |
5/1 | optional Final Review | Student Oral Reports (tba 5/2-5/4) |
5/5 | (Sat.) optional NATCAR contest (UC Davis) | |
5/11 | final exam Fri. May 11, 1130am-230 pm | |