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 Tu/Th 12-1pm 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 3-4pm. 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. Ohlnie, 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
	3/26	Spring Break	Spring Break
11	4/3	feedforward control and filtering demo: embedded programming II	practice course and step response Progress report due Tues. Apr. 3
12	4/10	HW and SW robustness Demo: car tuning	Round 1: likely Mon 4/9
13	4/17	Mechatronic system examples I	CAL Day Sat April 21
14	4/24	Mechatronic system examples II	Round 2: likely Mon 4/23, **lab clean**
15	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	