After completion of EE192, *Mechatronic Design Laboratory*, students should be able to:

1) Program a microcontroller using interrupts, timers, PWM, A/D, and serial interface to implement a real time control system with telemetry.

2) Design, layout, assemble, and debug power supply and op amp sensor circuits on printed circuit boards.

3) Design 30 amp low voltage brushed DC motor control circuits and interface to a microcontroller.

4) Design, construct, and debug single op amp amplifier, detection, and filtering circuits.

5) Design and tune basic P, PD, and PID discrete time controllers for first and second order systems on a microcontroller.

6) Design and implement a simple FIR or IIR filter on a microcontroller.

7) Design and implement a Matlab/Simulink simulation for a bicycle kinematic model of a car.

8) Collect sensor data from a real system, and interpret noise level and dynamic response.

9) Build electrical connectors and wire a system, being aware of wiring power dissipation and connector use.

10) Solder reliable connections.

11) Design an optical velocity sensor, and calculate speed on a microcontroller.

12) Design, debug, and test interactions between electronics hardware, mechanical hardware, software, and environment on an autonomous car.

13) Document electronic designs, including schematics and parts layout.

14) Draw a block diagram for a software system.

15) Work in teams with mixed expertise in software, analog design, signal processing, and control.

16) Work with continual incremental (weekly) deadlines, with just-in-time information and implementation, and “better is the enemy of the good” approach.