

EE40LX – Lab Parts Kit – Rev 1.3 (June 8, 2015)

Introduction

EE40Lx revolves around the construction of a robot powered by the MSP430G2553 LaunchPad. The construction of the robot project constitutes a peer-reviewed part of the course worth 50% of the overall score.

Recommended Equipment

Access to a **digital multimeter** is **required** to reliably debug circuits. An oscilloscope would enhance some modules in the course, but is not necessary to build the robot.

myDAQ Information

The video modules use the MyDAQ and the NI myProtoBoard as measurement equipment to help debug their circuits. Purchase of the myDAQ is not required. National Instruments has made available the MyDAQ and NI myProtoBoard as a bundle, as well as the NI myProtoBoard alone for students enrolled in this course. The myDAQ ordering page is: <http://www.studica.com/us/en/BerkeleyMOOC.html>

Microcontroller

We recommend using whichever microcontroller you like to follow along with the course. We will be using the MSP430G2 LaunchPad and will be supplying code samples for this platform. However, you are welcome to bring another microcontroller like the Tiva C LaunchPad or Arduino if you are comfortable writing simple programs for them.

Parts Kit Purchase

The parts included in the construction of the robot can be purchased at the Newark page.

- All regions:
<http://www.element14.com/community/community/learning-center/online-learning/moocs/edxucb-bridging/>

There are four main categories of parts: Electronics, power, wiring, and mechanical parts. We have listed several potential options for powering the robot and completing the wiring.

Electronic Parts

These are the main electronic parts used to build the various robot circuits.

Qty	Part	Manufacturer	Man. Part #
1	Solderless Breadboard	MULTICOMP	MCBB400
3	Red LED 2.1V 10mA 5mm	MULTICOMP	MCL053PT
2	OPA2344 Dual Amp (DIP) –	TEXAS INSTRUMENTS	OPA2344PAG4

	This makes a total of four op amps with rail-to-rail output.		
1	LM1086 3.3V Regulator	TEXAS INSTRUMENTS	LM1086CT-3.3/NOPB
2	STANDARD DIODE, 1A, 50V, DO-41	MULTICOMP	1N4001
2	PN2222 (NPN transistor)	FAIRCHILD SEMICONDUCTOR	PN2222
2	DC Motor, 9100 rpm max speed, 6V DC supply voltage, 20g-cm max torque, size 130	ADAFRUIT INDUSTRIES	711
2	Photocell	EXCELITAS TECH	VT90N1
2	RESISTOR, METAL FILM, 300 OHM, 250mW, 1%	MULTICOMP	MF25 300R
2	RESISTOR, CARBON FILM, 1KOHM, 250mW, 5%	MULTICOMP	MCF 0.25W 1K
3	RESISTOR, CARBON FILM, 10KOHM, 250mW, 5%	MULTICOMP	MCF 0.25W 10K
7	RESISTOR, CARBON FILM, 2.7KOHM, 250mW, 5%	MULTICOMP	MCF 0.25W 2K7
1	RESISTOR, CARBON FILM, 100KOHM, 250mW, 5%	MULTICOMP	MCF 0.25W 100K
1	Piezo Buzzer	MULTICOMP	MCKPT-G1340-3917
1	Electret microphone, 50 to 16000 Hz response, 10V max operating voltage	PRO SIGNAL	ABM-707-RC
2	CAPACITOR ALUM ELEC 10UF, 16V	MULTICOMP	MCGPR16V106M5X11-RH
2	CAPACITOR CERAMIC, 1UF, 25V, Y5V, +80	VISHAY BC COMPONENTS	K105Z20Y5VE5TL2
1	MSP430 LaunchPad	TEXAS INSTRUMENTS	MSP-EXP430G2

Power

The robot runs on 9V DC. There are some options to power your robot.

Battery Power – Requires a 9V battery and a 9V snap connector.

Battery power will allow your robot to move around freely, but you may deplete the charge on a number of batteries before finishing the course!

Qty	Part	Manufacturer	Man. Part #
1	9V Battery		
1	9V snap connector	KEYSTONE	234

Wall Power – Requires a 9 VDC (500 mA minimum) wall adapter and breadboard-friendly 2.1mm DC barrel jack. You may already have a wall adapter at home that works for this purpose. The advantage of this method is that you will never worry about running out of battery power. However, your robot will need to be near a wall outlet!

Qty	Part	Manufacturer	Man. Part #
1	9 VDC 1000 mA regulated switching power adapter (North American power plug)	ADAFRUIT	63
1	Breadboard-friendly 2.1mm	ADAFRUIT	373

	DC barrel jack		
--	----------------	--	--

Wires

To make connections between components on your breadboard, you will need some wires.

Connections to the MSP430 LaunchPad will require 9 female-male jumper cables.

Qty	Part	Manufacturer	Man. Part #
1	Wire Jumpers (female-male pack of 10)	MCM	21-14551

To make the remaining connections, you have several options. You may choose to purchase a large spool of 22-gauge insulated wire and wire strippers like those we use in the videos. This will allow you to cut wires of custom lengths to complete your wiring.

Qty	Part	Manufacturer	Man. Part #
	22 gauge wire (a few meters)		
1	Wire strippers/cutters	DURATOOL	3613

You may instead purchase a large number of premade male-male jumper cables. The disadvantage to this approach is that you will not have control over the lengths of the wires, so you will have many long loops of wire on your robot. This will not cause any electrical issues, but it may make it more difficult to wire the robot.

Qty	Part	Manufacturer	Man. Part #
1	Wire Jumpers (male-male pack of 65)	MULTICOMP	MCBBJ65

Mechanical Parts

Mechanical parts involve the most flexibility. These comprise the main body of your robot. In the inaugural run of the course, students came with a creative array of solutions that ***did not use any of these parts.***

For example, one student used cork with a coin glued to it as his eccentric weight, while another student used a stuffed animal instead of a craft stick frame!

Qty	Part	Manufacturer	Man. Part #
4	CABLE TIE, NYLON, 190.5MM L, 50LB, NATURAL	THOMAS & BETTS	L-7-50-9-C
8	Jumbo wooden craft sticks, 6"Lx3/4"Wx1/16"H	Local Hardware OR Ice Cream	
2	Conical Compression Spring, 1.00" Long,.720" Large OD,.281" Small OD,.042" Wire OR spring from a D-cell battery OR toothbrush bristles	Local Hardware	
2	3/8"-16 thread nuts, or some weight	Local Hardware	
	Glue – hot melt glue or Elmer's	Local Hardware	