

Introduction

Summary:

This course is intended for beginning ECEN students taking ECEN 191 at BYU. We assume that students taking this course have a high school level education and are not required to know anything about electrical engineering or hobby engineering. If you are a beginner this is the course for you.

Learning Outcomes:

The final product from this course is a simple autonomous car named the AutonoMouse. Students will learn the following skills while developing their car:

- Learn what Arduino is
- Learn how to solder pins onto a PCB
- Learn how to code Arduino Nano
- Learn prototyping with breadboards
- Learn how LED's work
- Learn about servos and pulse width modulation signals
- Learn about voltage regulators
- Learn how to spin a servo
- Learn how to work a sensor
- Learn about HC-SR04
- Learn about PCBs
- Learn to solder a PCB
- System integration
- Troubleshooting

Materials You Need to Buy:

The following materials you will need to buy yourself:

Arduino Nano w/out/RC				Gatorade bottles work best
Part	Quantity	Unit Price	Subtotal	
1 inch diameter bottle cap	2		\$0.00	
Zip ties	3	\$0.03	\$0.09	
Arduino Nano	1	\$4.00	\$4.00	
Switch-SPDT-BB	1	\$0.06	\$0.06	
Voltage Regulator (Q-7805c)	1	\$1.65	\$1.65	
0.1 uF Ceramic Capacitors	1	\$0.06	\$0.06	
0.33 uF Ceramic Capacitor	1	\$0.06	\$0.06	

9V Battery	1	\$1.25	\$1.25	
Battery Cap	1	\$0.44	\$0.44	
Male header Pins	6	\$0.02	\$0.12	
Female Header Pins	80	\$0.02	\$1.60	
Continuous Servo	2	\$1.80	\$3.60	
				\$0.40 per in ² , ask the shop techs to print Chassis1.1 AutoNoMouse for the ECEN 191 class
AutoNoMouse Chassis1.1 PCB	3	\$0.40	\$1.20	
Sensor Sonar	1	\$2.20	\$2.20	
LED Colored	1	\$0.05	\$0.05	
CABLE-USB A-Mini	1	\$0.99	\$0.99	
				\$0.08 per in ² ask the shop techs to cut Arduino_nano_chassis.svg for the ECEN 191 class
Acrylic	1	\$1.62	\$1.62	
Laser Time Acrylic	2	\$0.06	\$0.12	
Total			\$19.11	

Buy these from the ECEN shop. This is a requirement for part of this lab. (This table is just an estimate for these parts, pricing may have changed) Also, take the time to get acquainted with the ECEN shop. It is a valuable resource on campus.

- 2 Bottle Caps for wheels (Gatorade caps work nicely for this)
- Computer (this is for programing; a laptop works best because you can bring it into the lab but a desktop at home would also work)

Tools Required:

You will need access to the following tools. These can be found in student workshops in the ELC CB41, or you may buy your own as part of your personal electronic kit.

- Breadboard
- Jumper Wires
- Hot glue gun+hot glue
- Soldering station

How to Access Code for the Labs:

In this course you are not required to know how to code, however, you will still need to know how to download and use Arduino IDE to upload code to your Arduino Nano. Each time the labs ask you to download and upload code go to <https://github.com/BYU-ELC/AutoNoMouse>. This is a GitHub repository that stores all the files for this course. If you're familiar with GitHub you can git clone the repository if you're not familiar then navigate to **Arduino_Nano/Labs/(lab# that you're on)**. The code file is a .ino file. Copy and paste the code into Arduino IDE and you'll be good.