

*GEEN 1200 - Engineering Discovery 1*  
**Electrical Engineering and Computer Engineering (EECE) Module**  
**Schedule, Lecture, and Assignment**  
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**PART I: SCHEDULE**

Activity	Description	Assessment	Due Date (time)	Points
1	Lecture - Introduction to Arduino	<b>D2L Quiz #1</b>	<b>11/6/2017 (noon)</b>	<b>20</b>
2	Preparation for Lab 1 – Read the Lab 1 Assignment Download & extract Arduino IDE software Type up & save the code for laboratory projects (optional)		11/7 (8am)	<b>20</b> You earn this only if you have done it BEFORE Lab 1
3	Lab 1 Complete the following (1) Arduino IDE installation (2) project 1 – Blinking LED (3) project 2 – LED Marquee (4) project 3 – 7-segment LED	Completion of 4 lab activities	11/7 (during lab)	<b>75</b> (25 pts @for 2,3,4; 1 used to assess preparation)
4	Lab 2 preparation Read the Lab 2 Assignment Create/install files for DHTLib Create files for in class projects (optional)		11/9 (8 am)	<b>10</b> You earn this only if you have done it BEFORE Lab 2
5	Lab 2 Complete the following (1) basic data logger (2) choice of 2 extension set projects	Completion of 3 lab activities	11/9 (during lab)	<b>75</b>
6	Study on your own more about Arduino	<b>D2L Quiz #2</b>	<b>11/14/2017 (noon)</b>	<b>20</b>
7	Lab 3 preparation Read the Lab 3 Assignment Type up & save the code for laboratory project 1 At the very least, create pseudocode for project 2 of lab 3		11/14 (8 am)	<b>10</b> You earn this only if you have done it BEFORE Lab 3
8	Lab 3	Completion of 2 lab activities	11/14 (during lab)	<b>75</b> 25 pts for a 50 pts for b
9	Wrap up	Reading & Writing Assignment	11/21	<b>20</b>

## PART II: LECTURE

### 1. Overview

The objective of this module is to introduce students to some of the far-reaching career paths available for electrical and computer engineers. The products of several of these job paths will be illustrated by building a simple data acquisition system using a DHT22 humidity and temperature sensor and an Arduino Uno board connected to a host PC which will then be extended to provide BlueTooth communication capability.

### 2. Introduction

Arduino is an open-source electronics platform based on easy-to-use hardware and software [1]. The Arduino UNO is a small microcontroller board with a USB plug to connect to your computer and a number of connection sockets which can be wired up to external electronics, such as motors, relays, light sensors, laser diodes, loudspeakers, microphones, etc. [2]. The board can be powered through the USB connection from the computer or from a 12 V battery adapter or even a 9V battery.

An Arduino UNO board (see Fig.1) consists of an 8-bit Atmel AVR microcontroller with complementary components to facilitate programming and incorporation into other circuits. Since the schematics for the Arduino UNO are readily available as open source materials, many other manufacturers make and market UNO boards which are compatible to the Arduino UNO. We'll be using the UNO compatible board from SainSmart in the lab.



Figure 1: Top view of Arduino UNO (left) and SainSmart UNO (right).

The Arduino software consists of a standard programming language compiler and the boot loader that runs on the board. Arduino and Arduino compatible hardware is programmed using a language similar to C/C++ with some slight simplifications and modifications within a processing-based integrated development environment, the Arduino IDE.

Usually, each new project requires the following steps:

- 1) Construction of an (external) electronic circuit to be connected to the Arduino compatible hardware. Often this circuit is constructed on a protoboard – also known as an experimenter’s breadboard or wireless breadboard.
- 2) Creation of an Arduino sketch (i.e., program or code), which contains the sequence of steps or instructions the microcontroller is to follow.
- 3) Running the Verify and Compile operations to prepare the sketch for use with the microcontroller. Any syntax errors located at this stage require debugging (correction) and the verify and compile operations are repeated until the program is error free at this stage.
- 4) Upload the compiled sketch to the microcontroller on the board. At this point, the sketch is running and you should be able to observe operation of your program. You may also have logic errors in your sketch that become apparent during operation.

## References

- [1] What is Arduino?, 2015, [Online]. Available: <https://www.arduino.cc/en/Guide/Introduction>  
[2] Simon Monk, 30 Arduino Projects for the Evil Genius, McGraw Hill, 2010.

## PART III: PRE-LECTURE ASSIGNMENT AND D2L QUIZ

### 1. Watch a video

To see the basic steps of working with the Arduino, for the first project you’ll build in lab – **you should watch the following YouTube video:** <https://www.youtube.com/watch?v=dnPPoetX0uw>

Even though this video covers the same project, it emphasizes important concepts. As you watch this video, consider the following questions. **You’ll need to be able to answer questions similar to these on the D2L Pre-Lecture Quiz.**

- (1) What three pins on the Arduino Uno board will be used for the blinking LED project?
- (2) Is the longer or shorter lead of the LED connected to pin 13? ... pin “grn”?
- (3) How is a “note” (or comment) line started in an arduino sketch?
- (4) What is an arduino program called?
- (5) How many times is the “setup” function run in an arduino sketch?
- (6) How many times does the “loop” function for the blinking LED project run?
- (7) How is an executable line in an arduino sketch terminated?
- (8) During which step of arduino project creation are (most) syntax errors found?
- (9) During which step of arduino project creation are (most) logic errors found (and corrected)?
- (10) What command would you use in an arduino sketch to cause the arduino to “wait” for 1 second? ¼ second?

### 2. Take the Pre-Lecture Quiz

The pre-lecture quiz is posted on D2L. You must complete the quiz no later than NOON on 11/6. This 20 point quiz will be automatically graded. You may take it twice; your best score will be used.

### 3. Main Resources for this Module

Finally, please take a minute to visit Dr. Ababei’s web site at <http://dejazz.com/> for all the resources regarding the activities of this module. Click on "Teaching" on the left, and then, click on "Engineering Discovery 1", on the right hand side. You should get to <http://dejazz.com/geen1200/index.html>

