

Introduction to Arduino

Course Syllabus & Accompanying Materials



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Summer 2018

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1. INTRODUCTION

Introduction to Arduino is a 3 week (15 day) unit meant to introduce electricity, circuits and prototyping to students with little to no experience. This course will follow the contents of the *Make book: Learn Electronics with Arduino* by Jody Culkin and Eric Hagan. According to the Preface, it was written “as an introduction to electronics and the Arduino platform for the complete beginner.” This book and the accompanying material will guide students through basic concepts of electricity, circuits and programming. It will give students a foundation in prototyping that will better equip them to take on Challenge Problems using an Arduino.

2. MATERIALS

Book *Learn Electronics with Arduino: An Illustrated Beginner's Guide to Physical Computing (Make)* 1st Edition. ISBN: 978-1680453744

<https://www.makershed.com/products/make-learn-electronics-with-arduino>

TinkerCAD* <https://www.tinkercad.com/> (or other circuit simulation software)

Parts*	Breadboard	10K potentiometer
	USB A-B cable	3 momentary switches/buttons
	9-volt battery	Photoresistor
	9–12-volt power supply	Speaker, 8 ohm
	9-volt battery cap or holder	2 servo motors
	Assorted LEDs, a variety of colors	Jumper wires
	Assorted resistors	

Tools Multimeter

 Needle-nose pliers

 Wire strippers

* The Guided Notes referenced later in the Syllabus ask students to simulate a circuit using the TinkerCAD website. Students are also expected to physically build the circuit with the Parts listed above. If an instructor does not have access to the Parts, the lesson can still be completed by only simulating the circuit on TinkerCAD or another circuit simulation software.

3. STANDARDS

The following International Society for Technology in Education (ISTE) Standards for Students are covered during this unit. The full list of standards can be located on the ISTE website <https://www.iste.org/standards/for-students>

Empowered Learner	1a - Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes.
Digital Citizen	2c - Students demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property.
Innovative Designer	4c - Students develop, test and refine prototypes as part of a cyclical design process.
Computational Thinker	5c - Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.

4. SYLLABUS

Each day students will work to complete a chapter in Learn Electronics with Arduino book. Accompanying each chapter are resources to provide the opportunity to give feedback to students on each chapter's learning goals. To use the linked Google Forms guided notes, "make a copy" of the Form to use with your Google Account. If a Google Account is not available, follow the link for "all files" to download .pdf versions of the form.

Guided Notes .pdf files <https://goo.gl/m7XxmH>

Day 1	Class Activity – Guided Notes Resource Document – https://goo.gl/UaUcqE Reading Assignment – Chapter 1: Introduction to Arduino
Day 2	Class Activity – Guided Notes Resource Document – https://goo.gl/aGpPrv Reading Assignment – Chapter 2: Your Arduino
Day 3	Class Activity – Guided Notes Resource Document – https://goo.gl/XsTXWh Reading Assignment – Chapter 3: Meet the Circuit

Day 4	<p>Class Activity – Guided Notes</p> <p>Resource Document – https://goo.gl/7abe6C</p> <p>Reading Assignment – Chapter 4: Programming the Arduino</p>
Day 5	<p>Class Activity – Guided Notes, Ohm’s Law Practice Problems</p> <p>Resource Document – https://goo.gl/MsnC1i</p> <p>Resource Document – Ohm’s Law Worksheet (Appendix A)</p> <p>Reading Assignment – Chapter 5: Electricity and Metering</p>
Day 6	<p>Class Activity – Guided Notes</p> <p>Resource Document – https://goo.gl/yViTmR</p> <p>Reading Assignment – Chapter 6: Switches, LEDs and More</p>
Day 7	<p>Class Activity – Guided Notes</p> <p>Resource Document – https://goo.gl/wvAi47</p> <p>Reading Assignment – Chapter 7: Analog Values</p>
Day 8	<p>Class Activity – Guided Notes</p> <p>Resource Document – https://goo.gl/PA6XZb</p> <p>Reading Assignment – Chapter 8: Servo Motors</p>
Day 9	<p>Class Activity – Guided Notes</p> <p>Resource Document – https://goo.gl/stC8ub</p> <p>Reading Assignment – Chapter 9: Building your Projects</p>
Day 10	<p>Class Activity – Introduction to Capstone Project</p> <p>Resource Document – Capstone Grading Rubric (Appendix B)</p>
Days 11 - 14	<p>Class Activity – Capstone Project</p> <p>Resource Document – Capstone Grading Rubric (Appendix B)</p>
Day 15	<p>Class Activity – Capstone Project Presentations</p> <p>Resource Document – Capstone Grading Rubric (Appendix B)</p>

5. APPENDIX A: OHM'S LAW PRACTICE PROBLEMS

Ohm's Law Practice Problems

Formulas: $V=IR$ $I=V/R$ $R=V/I$

V = Voltage in Volts (V)

I = Current in Amperes (A)

R = Resistance in Ohms (Ω)

What is the resistance given the voltage and current?

V = 240	
R =	
I = .5	

V = 12	
R =	
I = 2.7	

V = 1.5	
R =	
I = .7	

V = 20	
R =	
I = 10	

V = 120	
R =	
I = 5	

What is the voltage given the current and resistance?

V =	
R = 1500	
I = .03	

V =	
R = 3	
I = 10	


V =	
R = 1.5	
I = 3.7	

What is the current given the voltage and resistance?

V = 10	
R = 2	
I =	

V = 120	
R = 5	
I =	

V = 24	
R = 12	
I =	



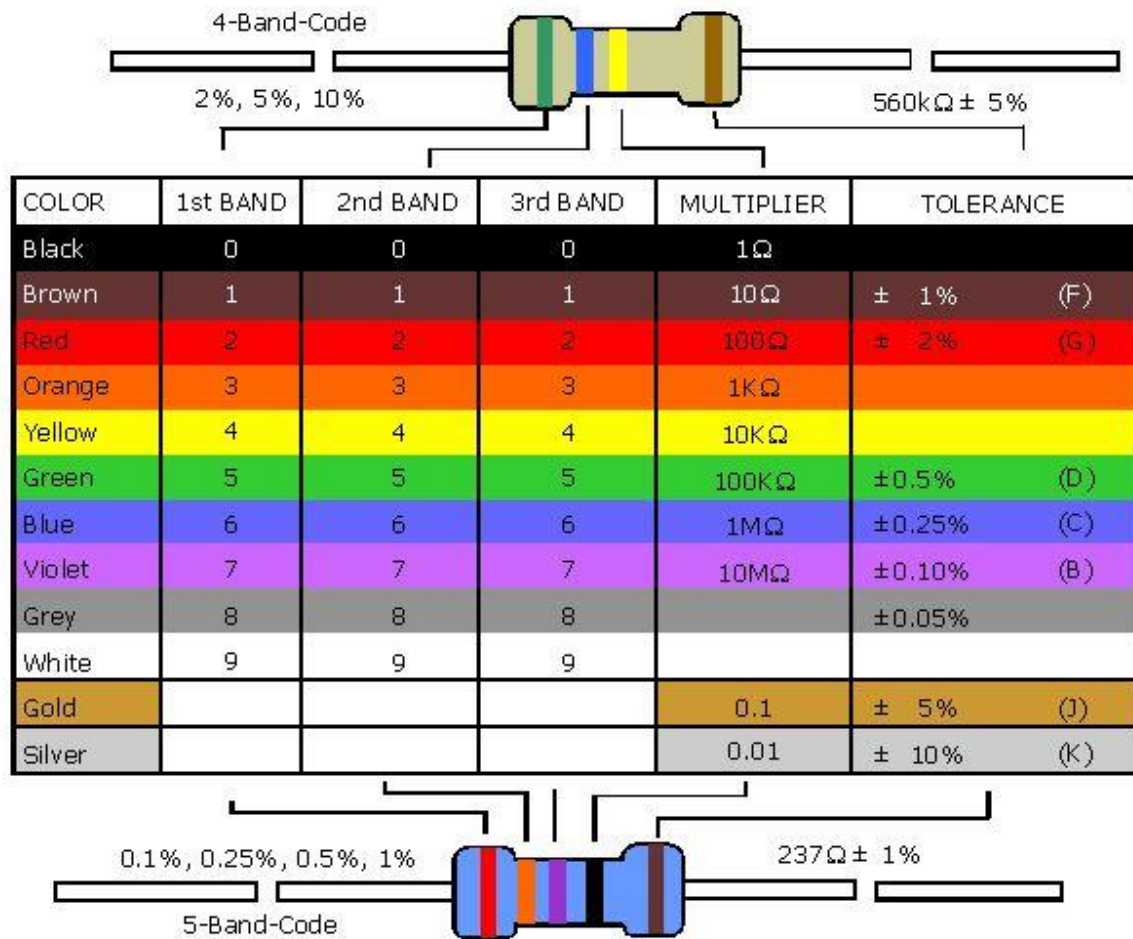
6. APPENDIX B: CAPSTONE PROJECT

Arduino Capstone

After completing the final chapter of the book *Learn Electronics with Arduino: An Illustrated Beginner's Guide to Physical Computing*, you now have the opportunity to develop your own Arduino Project. In order to develop your own project, follow the steps outlined in Chapter 9: Brainstorm ideas. Outline your project. Break it down into component parts. Test. Reflect and Repeat. Remember to give credit to your resources and to document by taking clear pictures and writing up a summary of your project. Possible grading rubric below.

Category	3	2	1	Total
Outline	System with input, output & code is shown.	Components and the type of behavior needed in the code is listed.	Project ideas are organized in outline form.	
Components	Project is broken into parts and ranked from simplest to most difficult.	Project is broken into parts.	Project is presented as a whole.	
Testing	Project is tested by someone outside of class.	Project is tested by instructor/classmate s.	Project is tested by creator(s).	
Summary	Personal thoughts on success and failures of the project. Suggestions for improvement from testing data is considered and more than 1 photo is used to help explain the project.	Personal thoughts on success and failures of the project. Suggestions for improvement from testing data considered.	Personal thoughts on success and failures of the project.	
References	All material used is referenced.	1-2 items are not referenced.	More than 2 items are not referenced.	
Totals	15 points			

7. APPENDIX C: RESISTOR COLOR CODES



Electronix Express / RSR
<http://www.elexp.com>

1-800-972-2225
 In NJ 732-381-8020

Figure 1 Resistor Color Codes Electronix Express (RSR Electronics Inc.) © 2018