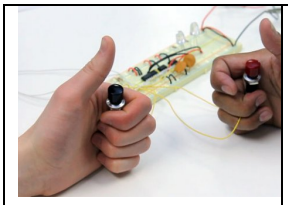
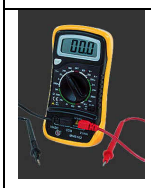
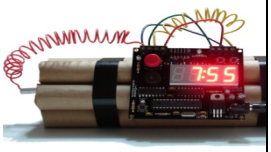
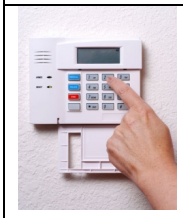
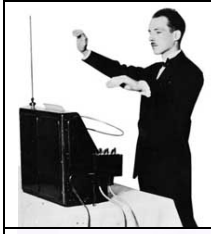
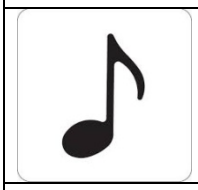
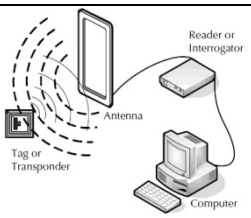
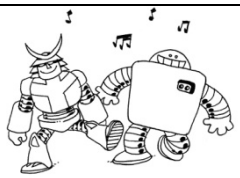
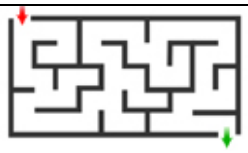
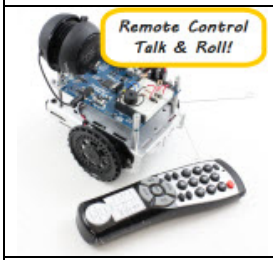
Iona Prep Robotics: Extra Projects and extensions:

Most of the equipment we use in this course is purchased from a company named Parallax. That company has excellent educational resources. If you are interested in doing another project, visit the following links to get some ideas.

http://learn.parallax.com/contest/robot-competition-ideas
http://learn.parallax.com/projects

	**1. Game Show buttons**: There are three contestants. Each has a button and an LED. When a question is posed, the first one to press a button has his LED turned on and then gets to answer the question. The microcontroller continuously interrogates the buttons and then turns on the appropriate LED. After the first button push has been recognized, any subsequent push is ignored until the reset button has been pushed. You could add a 7-segment display.
	**2. Electronic ohmmeter**. You connect a resistor (values between 100 ohms and 10 K ohms). The value of the resistance is displayed on the console (terminal). This will need to be calibrated. The calibration MAY be accomplished using Excel (see http://www.ionaphysics.org/lab/resources/Curve%20Fitting.pdf) or by other means. You could also add Text-to-speech "says" the resistance.
	**3. Disarm the bomb**: There is a bomb. The countdown starts at 9 seconds and counts down to 0. There are only two exposed wires, one is red and one is black. You may cut one wire. If you cut the correct one, the countdown stops. If you cut the wrong one the bomb detonates immediately. It will detonate when the count reaches 0. Neither wire connects to power.
	**4. Ignition of the space shuttle**. NASA has removed the key ignition switch from the space shuttle. It was supplied by General Motors and we all know the reputation of their ignition switches. Now the Shuttle uses the computer terminal. It asks you for a password (or number). You type it in. If the number is correct then a green LED lights and the shuttle countdown starts. If you type in the wrong password (or number) then the red LED lights and the countdown does not start.
	**5. Intrusion alarm**. Your locker contains many important things, like your lunch. You want to be sure that no one can break in. You push a button to ARM it and then close the door. If someone opens the door a red LED begins to blink. There are 4 buttons connected to the microcontroller. To disarm the alarm you must push the buttons in the proper order. If you push them in the wrong order or do not complete the sequence within the time limit, then the alarm sounds.

	**6. Theremin**. A theremin is a tone generator. Normally you control the frequency by moving your hand toward or away from an antenna. You could simulate this by using a phototransistor and making the frequency supplied to a piezo speaker depend upon the intensity of the light received.
	**7. LED as a light <u>detector</u>**. Read the report located at http://laser.physics.sunysb.edu/~tanya/report2/ and then do something creative which uses an LED as a detector, not as a generator of light. (This may turn out to be more difficult than it sounds.)
	**8. Staircase Piano.** See http://hub.jhu.edu/2014/04/14/musical-stairs-engineering to see what it means. You could use LEDs and photoresistors to detect the person on the stairs. This could be done on the stairs in the back of the physics lab, becoming a permanent exhibit. FUN!
	**9. Burglar alarm**. There are two circuits. The first is normally open. Opening a door closes the circuit and triggers the alarm. The second is normally closed. There is foil on the windows. Breaking the glass breaks the circuit and triggers the alarm. Once triggered, you have 30 seconds to enter a passcode. The alarm sounds if you do not enter the passcode.
	**10. RFID card reader**. Your Iona ID cards which unlock doors around the school are one example of an RFID (Radio Frequency ID) system. The card itself has no power supply. It gets a tiny amount of radio energy from the reader and responds with its (unique) id number. If the number is recognized by the computer then the computer sends a signal to unlock the door. Incidentally, the EZ-pass toll collection system is a different, but related technology. We have one RFID card reader (which is not compatible with the school system) and several unique cards. Create your own RFID system to do something useful.
	**11. Automatic door opener.** A PIR (passive infrared) sensor can tell when something nearby moves. This is a passive device. It does not send out energy but detects the heat generated by a person. The sensor detects the pattern of infrared energy in its surroundings. If the pattern changes suddenly, the sensor outputs a signal. The computer monitors this signal. Use the motion of a nearby person to open a door (using a servo). Alternately it could turn on a light or sound an alarm.
	**12. Electronic Thermometer.** A thermistor is a special kind of resistor whose resistance varies significantly with temperature. This project is a variation on #2 above, but calibrated to report temperature, not resistance.

	**13. Wild Card.** Use your own imagination/creativity. Build a device which does something interesting, useful, or fun. It must involve use of electronics and programming. If you are interested in science, you might want to make a measuring instrument which produces a record of its measurements. Consider an electronic device which produces music, or art, or something else.
	**14. Robot Dance Competition**. Could be done using either IR or radio remote technology. Look at http://learn.parallax.com/project/juke-bots-propeller-robots to get an idea. Would involve more than 1 robot. More project ideas from Parallax are located here: http://learn.parallax.com/projects
	**15. 2D-3D Maze Competition** See **http://learn.parallax.com/contest/2d-3d-maze-competition**
	**16. Remote Control Rock, Talk, and Roll ActivityBot** This looks like a really fun project. It uses sound capabilities of the Activity Board which you have not used before.
	**17. Remote search** Control the robot remotely using Radio Frequency signals (X Bee). You might use a joystick or keyboard to control the robot. Attach a video camera to the robot so you can see what the robot sees in the remote location.
	**18. Taser.** Probably not a good idea. ;-)
	**19. Useless box** **See** https://www.youtube.com/watch?v=K6dO1QJtVd8 Or search Youtube for useless box. You will find a variety of actions. Use your creativity.