



FIRIA LABS

Curriculum Guide *Preview*



Mission Pack: Lift-Off with CodeX



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Lift-Off with CodeX Overview



This mission pack expands Python coding knowledge gained during the Python with CodeX Mission Pack. During this mission pack, students will complete outer-space themed projects in your mission to Lift-Off with code. Adding peripherals to the CodeX allows students to interact with the world in new and exciting ways.

Pre-Mission Assignment

Students may benefit from reviewing the foundations of computational thinking. Discuss algorithms, variables and constants, functions, loops and conditional statements. Go over debugging strategies. Review basics of Python coding, like indenting, use of capitalization, importing libraries, etc.

Mission 1: Welcome to Lift-Off with CodeX



Students will receive the Mission Briefing about their trip to outer space. They explore the different peripherals in their kit, and connect their first peripheral - the red LED light.

Mission 2: Lift-Off!



Students will get the rocket ship off the ground by setting up a power switch, launch button, and countdown sequence.

Mission 3: Conserve Energy



Students will conserve energy on the ship by using motion detection to control when lights come on and how bright they are.

Mission 4: Hatch Lock



Students will use the NeoPixel ring and microswitch to make sure the shuttle's hatch locks are sealed.

Mission 5: Alert System



Students will use the temperature and sound sensors to design an alarm system that will let the crew know if something has gone wrong with the ship.

Mission 6: Life Support



Students will create proper air circulation on the ship by using a 360 Servo to rotate the fans.

Mission 7: Solar Tracking



Students will rotate solar panels to harness enough of the sun's energy to power the ship to Mars.

Mission 8: Prepare Lander



Students will use the object sensor to land safely on the surface of Mars.

Mission 9: Automatic Garden



Students will build a system to sense soil moisture and automatically water a garden.

Mission 10: Exploring the Surface



Students fire up the Martian Rover to explore the surface, watching out for large boulders that could damage the Rover.



Peripherals Kit Overview

Peripheral	Description	Missions	Peripheral	Description	Missions
	Button A standard momentary push button, used in applications for input.	2		Motion Sensor A PIR sensor, used for motion lights and alarms.	3
	Switch Locks into place when pressed; generally used to apply power or change a setting.	2, 6		Object Sensor It contains an LED that emits IR light and a phototransistor that detects IR light from nearby objects.	8
	Red (and White) LED Light emitting diode. Outputs red (or white) light.	1, 2, 3, 5, 7		8 RGB LED Ring Also called a NeoPixel ring. Pixels can be illuminated in any color individually.	4, 8
	Microswitch A simple form of a button; can be used as a crash sensor or to detect touch.	4, 8		360 (Continuous) Servo This servo rotates 360 degrees and can operate continuously.	6
	Potentiometer Often referred to as a knob; can be physically turned for variable input.	3, 5 +		180 (Positional) Servo This servo rotates forward or backward 180 degrees and can hold its position.	7, 8
	Temperature Sensor Can read raw values of a temperature.	5		3V Relay Can be used to switch larger power and voltages to devices.	9
	Sound Sensor Is sensitive to sound intensity; can be used to detect noises.	5		Soil Moisture Sensor Detects the amount of moisture present in the soil surrounding it.	9
	Light Sensor The photocell measures ambient light; used for solar monitoring & light dimming.	7		Water Pump A small water pump designed for submersible operations.	9
	Divider A circuit that cuts the voltage from analog sensors in half so you can get the full range of the sensor.	3, 5, 7, 9		Mission 10 External Peripherals <ul style="list-style-type: none"> • Mini Breadboard • Red and Amber LED • 2 100-Ohm Resistors • HC-SR04 Ultrasonic Distance Sensor • 10 Jumper Wires 	



Mission 1: Welcome to Lift-Off with CodeX

Overview and Notes: Your Mission: Should you choose to accept it...

We're going to outer space! This first project is all about getting to know the **peripherals** hardware. Before your students finish, they will connect the red LED peripheral to the CodeX and write some code to turn it on.

You may need to show them how to properly connect a peripheral to the CodeX. Each peripheral has a small cable for connecting. At one end of the cable is a latching connector, which fits into a mating receptacle on the sensor. The other end of the cable has a non-latching connector which connects to the CodeX. Both the sensor and the CodeX have "G" and "S" labeled to help you know the direction of the cable.

For the latching connection to each sensor, feel free to leave the cable attached after first use. Should you need to disconnect the latching connector from the sensor, there is a small lever that can be depressed with your thumb or a small screwdriver. For some connectors a slight downward flexing of the connector (in the direction you're pushing the lever) will help it clear the catch.

Remind students to be careful when using the peripherals, that they don't pull on the wires to disconnect, but rather grasp the connector housing when doing so.

Preparation and Materials:

- Create a class on the teacher dashboard.
- Students need a computer / laptop with the Chrome web browser.
- Make sure the students can successfully login to <http://make.firialabs.com>, create a student account and join the class with the code.
- Each student (or pair) needs a CodeX, peripherals kit and cables (red LED).

Peripherals Used



Standards addressed in the mission:

CSTA Standards Grades 6-8	CSTA Standards Grades 9-10	CSTA Standards Grades 11-12
<ul style="list-style-type: none"> • 2-CS-03 • 2-AP-11 • 2-AP-14 • 2-AP-19 • 2-IC-20 	<ul style="list-style-type: none"> • 3A-CS-01 • 3A-CS-02 • 3A-IC-24 	<ul style="list-style-type: none"> • 3B-CS-02 • 3B-AP-14 • 3B-AP-16 • 3B-IC-27



Mission 1: Welcome to Lift-Off with CodeX		Time Frame: 30 - 60 minutes					
Learning Targets <ul style="list-style-type: none"> I can safely connect and disconnect the red LED peripheral to my CodeX. I can use the peripheral value property to control the peripheral. 		Key Concepts <ul style="list-style-type: none"> Cable colors matter – they must match. <ul style="list-style-type: none"> Black is GROUND Red is VCC Power Yellow is SIGNAL One cable end has a latch and is connected to the peripheral. 					
Assessment Opportunities <ul style="list-style-type: none"> <i>Check for Understanding</i> in CodeSpace Match peripheral to name/description Exit ticket with cable colors Submit and/or check the PeriphIntro program Journal entry on their learning experience 		Success Criteria <ul style="list-style-type: none"> <input type="checkbox"/> Identify the peripherals in the Lift-Off kit. <input type="checkbox"/> Successfully connect and disconnect the red LED to the CodeX. <input type="checkbox"/> Write a program that successfully turns on and off the red LED. 					
Vocabulary <ul style="list-style-type: none"> Peripheral: A device that interacts with the CPU (common peripherals are LED lights, display screen, buttons, mouse, keyboard, and printer) Function: A named chunk of code you can run anytime just by calling its name; also called a procedure Parameter: A local variable in a function that receives a value passed into the function when it is called; information the function needs to complete its task Argument: Passing data to functions (information a function uses to complete its task) Variable: A name you assign to some data used in code instead of the literal, or actual, values Constant: A name for a value that doesn't change during program execution 							
New Python Code <table border="1" style="width: 100%;"> <tr> <td style="width: 35%;"><code>exp.digital_out(exp.PORT0)</code></td> <td>Used to set up a digital output peripheral (LED)</td> </tr> <tr> <td><code>led.value</code></td> <td>The property of the LED peripheral used to turn on/off the light</td> </tr> </table>				<code>exp.digital_out(exp.PORT0)</code>	Used to set up a digital output peripheral (LED)	<code>led.value</code>	The property of the LED peripheral used to turn on/off the light
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<code>led.value</code>	The property of the LED peripheral used to turn on/off the light						
Real World Applications <ul style="list-style-type: none"> Discuss the fact that all electronic devices have circuit boards inside. Challenge students to name a few peripherals they use every day, similar to the ones in the kit. Encourage students to give examples of how their lives are impacted by technology. See examples below: <ul style="list-style-type: none"> Bluetooth speaker, headphones VR headsets, webcams, etc. Medical equipment Technology in transportation or entertainment 							
Extensions <ul style="list-style-type: none"> Light up the CodeX pixel 0 to indicate where the peripheral is connected. Use the A and B buttons of the CodeX to turn on/off the red LED. Set up and write code for the white LED. Use the CodeX buttons to control the red and white LEDs. 		Cross-Curricular <ul style="list-style-type: none"> LANGUAGE ARTS: Students write a first-person essay about the impact of technology. SCIENCE: Students select one peripheral and research how it works or its uses in a science field. MATH: Many peripherals are digital and only use the values True or False. Review binary numbers. 					