

Parallax Inc.	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14
	Software Setup and Connection Test	Basic micro:bit programming in MicroPython	Add Modules to your micro:bit for robot programming	Robot Construction - Mechanical	Robot Navigation Basics	Circuit-Building Basics	Using Simple Sounds in Robotics	Sensor Navigation by Touch	Sensor Navigation by Visible Light	Sensor Navigation by Infrared Light	IR Remote Control (accessory hardware needed)	Line-following (accessory hardware needed)	Navigation with Ultrasound Distance Sensor on servo turret (accessory hardware needed)
cyber:bot 12-pack Plus	12 sets of all Parallax hardware needed for this unit is included in the cyber:bot with micro:bit 12-pack Plus Kit (#32712)												
Single cyber:bot with micro:bit Kit	All Parallax hardware needed for this unit is included in one cyber:bot with micro:bit robot kit (#32700)										3-function Universal Remote (#020-00001)	QTI Line-follower AppKit (#28108)	Ping))) Ultrasonic Sensor + Mounting Bracket Kit (#910-28015A)
Other materials needed	none	none	none	masking tape, pen, 5 AA batteries	none	none	none	none	flashlight	none		black electrical tape, poster board, or printed tracks	target objects such as cans or boxes
Approximate time	20 - 60 minutes	60-90 minutes	60-90 minutes	60-90 minutes	60-90 minutes	60-90 minutes	30-30 minutes	60-90 minutes	60-90 minutes	60-90 minutes	90 minutes	90-120 minutes	90-120 minutes
Adjustment suggestions	Shorten: IT/Teacher prepare ahead: Test web-based software or install desktop software. Test programming connection on each computer. Check firmware version on each micro:bit module and update if necessary.	Shorten: skip ternary operators in the Writing Functions section.	None: cyberbot module is required for robot programming	Note: If using rechargeable batteries, charge ahead of time. Shorten: Teacher or volunteers assemble robots ahead of time. (Un-assembling each year not necessary; hardware replenishment pieces available)	Shorten: Just observe each maneuver animation and discuss the parameter for servo_speed, but skip the Try This and Your Turn.	Shorten: skip building LED circuits, and use the pushbuttons to control the built-in LEDs on the board.	Shorten: skip the last activity, Songs with Lists.	Stop after this unit if needing to shorten the course or use only very simple circuits.	Skip this unit if looking to eliminate one navigation sensor option for time's sake.	Test work area for infrared light interference ahead of time. If present, skip this unit.	Shorten: skip adding obstacle detection.	No need for Unit 12 first. Shorten: use the Tracks PDF to print out line-following tracks, instead of creating them with poster board and black electrical tape. project.	No need for units 12 or 13 first.

Skills, concepts, & objectives (students will be able to...)	Access the micro:bit online programming software or Mu desktop software. Know how to check the firmware version in their micro:bit module and update if needed. How to load and run a very simple micro:bit program to test the connection.	Use a microcontroller program to send messages to a serial monitor for display, use variables, store and retrieve values from memory, solve math problems, make decisions to control program flow, count and control repetitions.	Understand what a Python language module is, how to install a module on the micro:bit.	Assemble a small robot from written and visual instructions. Identify different mechanical parts. Use a screwdriver and small wrench. Connect power to the robot.	Create programs to make a rolling robot move, understand different types of turns and how to make them by controlling each wheel's speed separately, make observations and measurements to fine-tune robot behavior.	Connect electronic components together on a solderless breadboard, match a schematic symbol to an electronic component, read a resistor's color-code, build an LED circuit and make programs to blink the light at different rates, build pushbutton circuits and write a program to control LEDs with pushbuttons.	Understand what a simple piezoelectric element is and how it makes noise. Install a piezoelectric speaker on to the cyber:bot board. Write programs that make the speaker sound tones of different frequencies to play notes. Use lists (similar to arrays) to play a series of notes in a sequence.	Understand how a whisker switch completes and electrical circuit, build whisker switch circuits connected to a microcontroller, create a program to monitor the state of a whisker switch, program a rolling robot to respond to obstacles detected by the whisker switches.	Understand where visible light wavelengths occur on the light spectrum; build a sensor system connected to a microcontroller that detects the difference in ambient visible light levels reaching two phototransistors ; program a rolling robot to navigate based on the difference in ambient light levels detected by two different light sensors.	Understand where infrared light wavelengths occur in the light spectrum; build a sensor system connected to a microcontroller that emits infrared light and looks for reflections, create programs to detect obstacles using reflected infrared light, program a rolling robot to navigate by responding to obstacles detected with infrared light reflections.	Design a user interface; decode IR signals from a Sony-protocol remote; program a rolling robot to perform different actions based on the IR remote signal it receives.	Add an array of line-detection sensors to the cyber:bot. Perform subsystem testing for the sensor array. Create code to store the sensor states in a binary value that is then used to select navigation states for line-following.	Mount an ultrasonic rangefinder on a servo turret on the front of a rolling robot. Write programs that sweep the servo turret and allow the rangefinder to scan the area for objects, then let the robot navigate avoiding the objects.
Tutorial link	Software Setup for micro:bit	Writing micro:bit programs	Add modules to your micro:bit	Build your cyber:bot	Navigation with the cyber:bot	Circuits on the cyber:bot	Sound for the cyber:bot	Touch Navigation for the cyber:bot	Visible Light Navigation for the cyber:bot	Infrared Light Navigation for the cyber:bot	Control your cyber:bot with an infrared TV remote	QTI Line Follower for the cyber:bot	Cyber:bot: Roaming with the Ping)))
Resource link (s)	micro:bit online Python editor	BBC micro:bit MicroPython documentation	cyberbot library (Python) download page	Small Robot Hardware Refresher Pack (#570-35000)	YouTube video: The Basics of Breadboarding	YouTube video: Cyber:bot with touch sensitive whiskers	YouTube video: cyber:bot light follower	YouTube video: cyber:bot with infrared sensors	YouTube video: cyber:bot with remote control	Printable Line-following Tracks PDF	YouTube video: Cyber:bot with Ping))) Mounting Bracket and Servo		
	Desktop Mu software		cyber:bot library reference	Parallax Continuous Rotation Servo (#900-00008)	Schematic Symbols reference								