



Unit Overview:

In this unit, students will learn how to incorporate digital and analog sensors to robotic builds and projects. Students will learn how to write custom programs that include conditional statements such as **if statements** and **if/then statements**.

Alignment to STEM Standards:

The table below highlights how this unit is aligned to the Computer Science Teachers Association (CSTA) K-12 Computer Science Standards and the Next Generation Science Standards (NGSS).

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 CSTA K-12 CS standards introduce the fundamental concepts of computer science to all students, beginning at the elementary level. [Click here](#) to view the standards.
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 NGSS Disciplinary Core Ideas (DCI) are standards related to content knowledge.

Recommended Grade Level:

3 - 8

Kid Spark STEM Lab:

 STEM Pathways or
 Engineering Pathways (w/Spark:bit)

Prerequisite Kid Spark Units:

Robotics & Coding 101

Lessons & Assessment	CSTA	NGSS-DCI
Lesson 1: Analog vs. Digital Sensors (60 Min.) In this lesson, students will learn the difference between analog and digital sensors. Students will also learn how to use the serial function in MakeCode to observe data from sensors that are connected to the Spark:bit.	1B-CS-01 Describe how internal and external parts of computing devices function to form a system. Concept: Computing Systems Subconcept: Devices	Engineering Design
Lesson 2: If Statements (120 Min.) In this lesson, students will learn how to create a program that utilizes if statements . Then, students will build and program a custom design that relies on an if statement to function correctly.	1B-AP-10 Create programs that include sequences, events, loops, and conditionals. Concept: Algorithms & Programming Subconcept: Control	Engineering Design
Lesson 3: If/Else Statements (120 Min.) In this lesson, students will learn how to develop a program that uses if/else statements . Students will observe how if/else statements can be used with digital and analog sensors to control a simple design.	1B-AP-10 Create programs that include sequences, events, loops, and conditionals. Concept: Algorithms & Programming Subconcept: Control	Engineering Design
Lesson 4: Creating a Light Gate (120 Min.) In this lesson, students will learn how transmitters and receivers can be used to create light gates. Students will build a simple mechanism and create a series of new programs to control the design.	1B-AP-10 Create programs that include sequences, events, loops, and conditionals. Concept: Algorithms & Programming Subconcept: Control	Engineering Design
Lesson 5: Creating a Proximity Sensor (120 Min.) In this lesson, students will learn how transmitters and receivers can be used to create a proximity sensor. Students will build and test a simple proximity-sensing device, then create a custom build of their own design.	1B-AP-10 Create programs that include sequences, events, loops, and conditionals. Concept: Algorithms & Programming Subconcept: Control	Engineering Design
Lesson 6: Free Build Challenge (60 - 120 Min.) In this lesson, students will apply the knowledge and skills they have acquired throughout the Exploring Sensors unit to develop a custom design or invention.	1B-AP-17 Describe choices made during program development using code comments, presentations, and demonstrations. Concept: Algorithms & Programming Subconcept: Program Dev.	Engineering Design
Unit Assessment: Exploring Sensors In this performance-based assessment, students will complete a series of tasks as they demonstrate their understanding of the core ideas and concepts that were covered throughout this unit.		

Target Vocabulary

The following key terms will be used throughout this unit. It may be helpful to explain these terms as they show up in lessons and challenges.

Analog Sensors - A sensor that can produce or convey a range of values.

Digital Sensor - A sensor that returns a boolean value of true or false.

Boolean - Something that is only true or false.

Serial Monitor - A visual monitoring tool within Makecode that allows you to view data being sent from the Spark:bit.

If Statement - A conditional statement that is used to execute a set of commands if a condition or test is true.

If/Else Statement - A conditional statement that is used to execute a set of commands if a condition or test is true. If the condition or test is false, another set of commands is executed.

Light Gate - A digital sensor that uses a transmitter to “transmit” a constant infrared (IR) signal to a receiver. When objects interrupt the signal, the sensor returns a boolean value of false. When no objects are interrupting the signal, the sensor returns a boolean value of true.

Proximity Sensor - A digital sensor that uses a transmitter and a receiver to detect or “sense” nearby objects. When an object is detected, the sensor returns a boolean value of true. When no objects are detected, the sensor returns a boolean value of false.



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