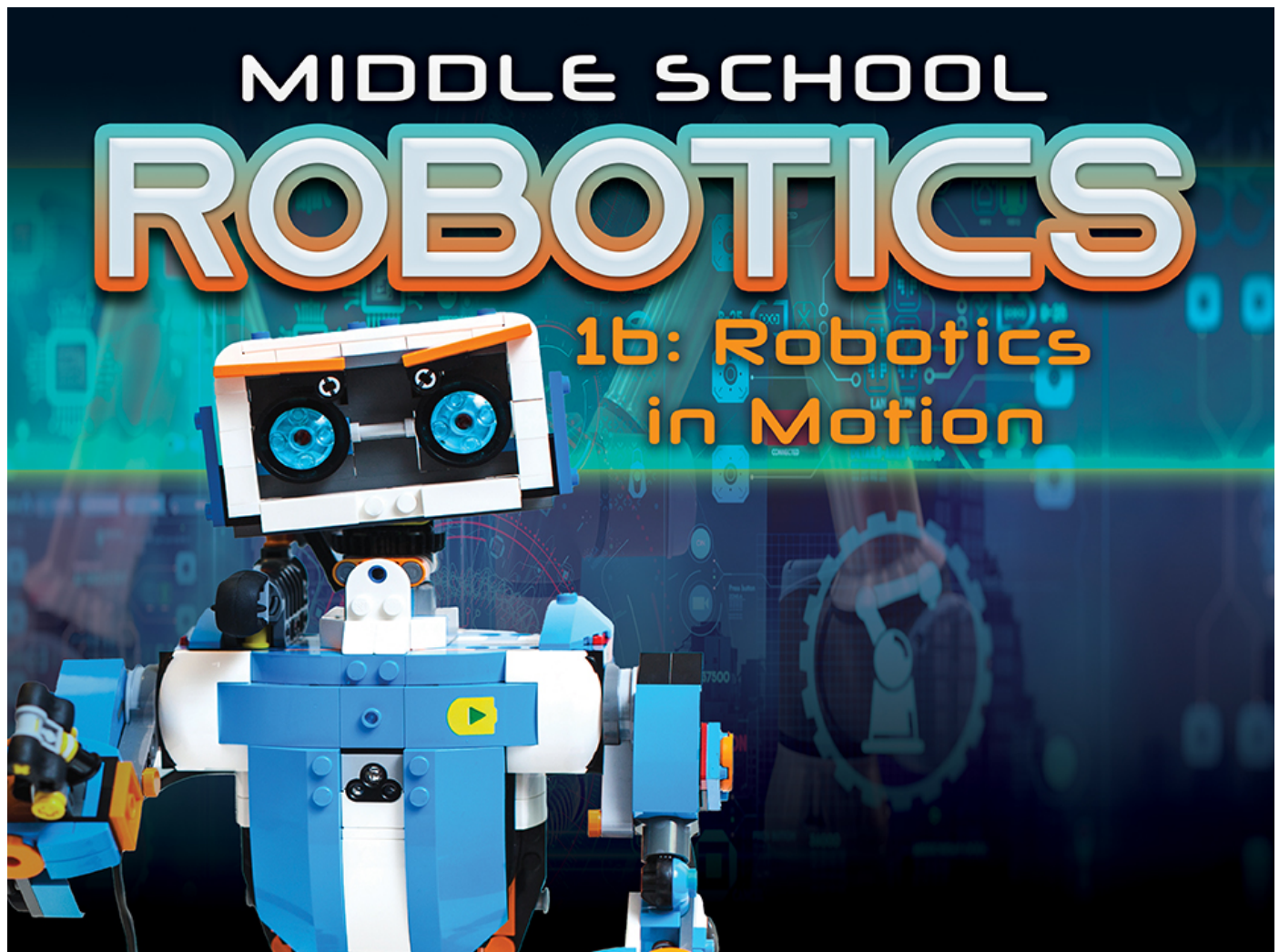


## Course Syllabus

What you will learn in this course



### **Middle School Robotics 1b: Robots in Motion**

Let's build a robot! Ever wonder how robots came to be and how they evolved over time? Is their impact on society good, bad, or somewhere in between? You will explore these topics and more. You will study a robot's anatomy to understand what each part does, so you can better understand how the system works as a whole, and this knowledge will fire up your imagination to design your own robot. You will also learn a little about programming so that you can communicate with the robot. Let's get started bringing your robot to life!

#### **Unit 1: Welcome to Robotics**

Welcome to the fascinating captivating world of robotics! Soon, we will discover the components that bring robots to life. We will also explore the remarkable history and evolution of robots and discover the

ways they are transforming our world. In addition, we will explore questions about the moral values, or ethics, which come along with the rise of robotics and the exciting opportunities and challenges they present.

## What will you learn in this unit?

After studying this unit, you will be able to:

1. Identify the components of a robot and their purposes
2. Discuss the history and evolution of robotics
3. Explain the uses of robots in industry, medicine, and other areas
4. Examine the ethical implications of robotics

Unit 1 Assignments	
Assignment	Type
Lesson 01: What Makes a Robot?	Lesson
Lesson 02: Robots Then and Now	Lesson
Lesson 03: Robot Types and Applications	Lesson
Lesson 04: The Impact of Robots	Lesson
Critical Thinking Questions	Submission
Activity 1: What Do I Want to Learn?	Submission
Activity 2: How Have Robots Been Influenced by the Past and Society?	Submission
Activity 3: What Parts Does a Robot Have?	Submission
Activity 3 (Alternate): What Parts Does a Robot Have?	Submission
Unit 1 Discussion 1	Discussion
Unit 1 Discussion 2	Discussion
Unit 1 Quiz	Multiple Choice

## Unit 2: How Does a Robot Work?

In this unit, we explore robotics, systems thinking, creativity, and safety. From structures and drivetrains to tools and equipment, you will gain practical skills while thinking about how robots work.

## What will you learn in this unit?

After studying this unit, you will be able to:

1. Apply systems thinking to understand the interconnectedness of a robot's parts

2. Explain a robot's drivetrain and how it relates to good chassis design
3. Compare and contrast motors and servos and describe how gearing is used to change motion
4. Summarize safety procedures in a robotics lab and how maintenance and troubleshooting are used to increase a robot's lifespan

<b>Unit 2 Assignments</b>	
<b>Assignment</b>	<b>Type</b>
Lesson 01: Exploring Systems and Design	Lesson
Lesson 02: Exploring Motion	Lesson
Lesson 03: Powering Motion	Lesson
Lesson 04: Safety, Maintenance, and Repair	Lesson
Critical Thinking Questions	Submission
Activity 1: How Can I Be Safe in the Robotics Lab?	Submission
Activity 2: How Can I Use the Engineering Design Process to Create a Robot and Solve a Problem?	Submission
Activity 2 (Alternate): How Can I Use the Engineering Design Process to Create a Robot and Solve a Problem?	Submission
Unit 2 Discussion 1	Discussion
Unit 2 Discussion 2	Discussion
Unit 2 Quiz	Multiple Choice

## Unit 3: All About Sensors

Robots use sensors to take in all kinds of data—optical sensors to see the unseen, pressure sensors which can feel the slightest touch, and temperature sensors which monitor the environment. How do these sensors work? What capabilities do they provide modern robots? We'll answer these questions and more as we explore various sensor technologies.

### What will you learn in this unit?

After studying this unit, you will be able to:

1. Define and categorize sensors used in robotics
2. Describe the technology employed to create sensors and develop functionality
3. Explain the application of sensors in various industries
4. Summarize how sensors create closed-loop robotics systems

Unit 3 Assignments	
Assignment	Type
Lesson 01: What's a Sensor?	Lesson
Lesson 02: Sensor Technology	Lesson
Lesson 03: Exploring Sensors	Lesson
Lesson 04: Sensors in Robotics Systems	Lesson
Critical Thinking Questions	Submission
Activity 1: What Have I Learned So Far?	Submission
Activity 2: How Can I Use a Sensors in My Projects?	Submission
Activity 2 (Alternate): How Can I Use Sensors in My Projects?	Submission
Unit 3 Discussion 1	Discussion
Unit 3 Discussion 2	Discussion
Unit 3 Quiz	Multiple Choice

## Midterm Exam

1. Review information acquired and mastered from this course up to this point.
2. Take a course exam based on material from the **first half** of the course (**Note:** You will be able to open this exam only one time.)

Midterm Exam Assignments	
Assignment	Type
Midterm Exam	Multiple Choice
Midterm Discussion	Discussion

## Unit 4: Do You Speak My Language?

Let's dive into the exciting world of robotics programming. In this unit, we will discover how robots think, make decisions, and carry out tasks through the magic of coding. In addition, we'll discuss coding from the point of view of algorithms, control structures, and design. This unit blends creativity, problem-solving, and technological innovation to show how humans communicate with robots.

### What will you learn in this unit?

After studying this unit, you will be able to:

1. Define and describe programming, algorithms, and their use in robotics

2. Explain control structures and summarize sequential and conditional programming
3. Describe an iteration control structure and apply complex structures to robotics
4. Summarize the history of coding in robotics and discuss how the design cycle has been used in its development

<b>Unit 4 Assignments</b>	
<b>Assignment</b>	<b>Type</b>
Lesson 01: Algorithms and Programs	Lesson
Lesson 02: Controls and Conditions	Lesson
Lesson 03: Iteration and Complex Control	Lesson
Lesson 04: All About Coding	Lesson
Critical Thinking Questions	Submission
Activity 1: How Can I Design and Build a Rube Goldberg Machine to Accomplish a Simple Task?	Submission
Activity 2: How Can I Create My Own Program Using a Computer Language?	Submission
Unit 4 Discussion 1	Discussion
Unit 4 Discussion 2	Discussion
Unit 4 Quiz	Multiple Choice

## Unit 5: What Can My Robot Do?

Let's explore the connection between the systems that bring your robot to life. We will look at how we might modify these systems to create robots that can do more things better and faster. Then, we'll journey from the drawing board to the real world as we discover the power of two-dimensional and three-dimensional representations in robot design. Finally, we'll talk about requirements, trade-offs, and decision-making, the critical factors that separate good robots from great ones.

### What will you learn in this unit?

After studying this unit, you will be able to:

1. Define technological systems and explain how they support a robot's functions
2. Describe how technological systems can be modified to improve a robot's functionality
3. Provide details on how robots can be represented throughout the design process
4. Explain the process of identifying requirements, making trade-offs, and using resources when designing a robot

Unit 5 Assignments	
Assignment	Type
Lesson 01: Technological Systems	Lesson
Lesson 02: Modifying Technological Systems	Lesson
Lesson 03: Representing Solutions	Lesson
Lesson 04: Requirements, Trade-Offs, and Understanding	Lesson
Critical Thinking Questions	Submission
Activity 1: How Can I Design Robots That Work Together?	Submission
Activity 2: How Can I Design and Program a Robot to Move Through a Maze?	Submission
Activity 2 (Alternate): How Can I Design and Program a Robot to Move Through a Maze?	Submission
Unit 5 Discussion 1	Discussion
Unit 5 Discussion 2	Discussion
Unit 5 Quiz	Multiple Choice

## Unit 6: Robots and the World's Needs

How do creativity and technology drive innovation? How do problem-solving and decision-making shape the development of new robotic systems? We'll look at the impacts of robotics as well as the challenges and opportunities they present. Then, we'll get to know some robots that are the problem-solvers in various fields, from disaster response to waste management. From here, you can start to imagine the robots you will make and the problems you will solve.

### What will you learn in this unit?

After studying this unit, you will be able to:

1. Describe the role of creativity in the development of robotic systems
2. List the problem-solving and decision-making steps that are part of the development of new robotic systems
3. Discuss how robots impact society
4. Identify different types of robots used to solve various engineering problems and the unique challenges they address

Unit 6 Assignments	
Assignment	Type
Lesson 01: Contributors to Robotic Design	Lesson
Lesson 02: Problem-Solving and Decision-Making	Lesson
Lesson 03: The Impacts of Robotics	Lesson
Lesson 04: Robots as Problem Solvers	Lesson
Critical Thinking Questions	Submission
Activity 1: How Might Robots Be Used in My Future Career?	Submission
Activity 2: How Can I Design a System That Meets My Goals?	Submission
Activity 2 (Alternate): How Can I Design a System That Meets My Goals?	Submission
Activity 3: What Did I Get from This Course?	Submission
Unit 6 Discussion 1	Discussion
Unit 6 Discussion 2	Discussion
Unit 6 Quiz	Multiple Choice

## Final Exam

1. Review information acquired and mastered from this course up to this point.
2. Take a course exam based on material from **all units** in this course. (**Note:** You will be able to open this exam only one time.)

Final Exam Assignments	
Assignment	Type
Final Exam	Multiple Choice
Final Discussion	Discussion