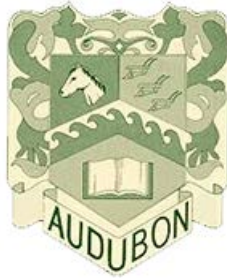


# Audubon Public Schools



## **AHS Robotics Curriculum Guide**

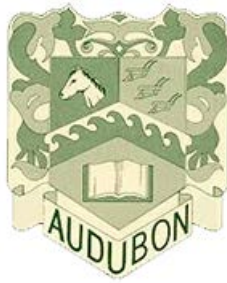
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August 15, 2018

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## Course Description

### Robotics

This course is designed to introduce the students to the world of robotics with emphasis on programming. The students will design and build robots to later be programmed to perform certain tasks. The students will also learn about safety, time management, and engineering.

## Curriculum Pacing Chart

### ROBOTICS

<b>SUGGESTED TIME ALLOTMENT</b>	<b>UNIT NUMBER</b>	<b>CONTENT - UNIT OF STUDY</b>
4 weeks	I	Introduction to Robotics
12 weeks	II	Programming using Robot C
6 weeks	III	Gears
8 weeks	IV	Multi-purpose Robots
8 weeks	V	Robot Wars

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UNIT I: Introduction to Robotics

ENDURING UNDERSTANDINGS		ESSENTIAL QUESTIONS	
Robots are machines that can help humans complete tasks		<ul style="list-style-type: none"> <li>• What are robots?</li> <li>• What are robots capable of?</li> </ul>	
Robots expand human capabilities in many ways including: precision, speed, repetition, ECT.		<ul style="list-style-type: none"> <li>• How can devices such as robots be brought to serve the needs of humans?</li> </ul>	
KNOWLEDGE	SKILLS		NJCCCS

<p>Students will know:</p> <p>The Design Loop consists of stating a problem, gathering information and resources, brainstorming solutions, choosing and creating the “best” solution, evaluating results, and feeding back to the initial step.</p> <p>Accurate recordkeeping and documentation are vital to the engineering process.</p> <p>Robots do their work:</p> <ul style="list-style-type: none"> <li>• In environments, inhospitable to humans</li> <li>• More accurately than humans</li> <li>• With sensitivity to finer inputs</li> <li>• Tirelessly and flawlessly</li> </ul> <p>When using hand tools:</p> <ul style="list-style-type: none"> <li>• cut away from oneself</li> <li>• wear safety glasses</li> </ul>	<p>Students will be able to:</p> <p>Identify the engineering design process</p> <p>Keep a engineering notebook and accurate records of their progress</p> <p>Identify how robots help humans in the work force, military, and everyday life</p> <p>Safely use any and all tools involved in making robots</p>	<p><u>NJCCC Science:</u> 5.1.12.C.1-2</p> <p><u>NJCCC Technology:</u> 8.2.12.A.3 8.2.12.B.1-3 8.2.12.B.5</p> <p><u>NJCCC Safety:</u> 9.2.12 F.1-5</p>
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 UNIT I: Introduction to Robotics

SUGGESTED TIME ALLOTMENT	CONTENT-UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
4 Weeks	The definition of robots and Robotics  Wearing Safety Glasses  Safe use of Hand Tools  Keeping an Engineering Journal  The Design Loop/Engineering Design	<p style="text-align: center;"><u>Resources:</u></p> Teacher generated handouts, Power Point slides, demonstrations  <p style="text-align: center;"><u>Suggested Activities:</u></p> Digital and print research Written paper  Performance assessment of tool safety  Engineering Journal

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UNIT II: Programming Using Robot C

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS	
Robots can only do what they are programmed to do. If the program is not correct the robot will not do what you want it to do.	<ul style="list-style-type: none"> <li>• What can I make my robot do with RobotC?</li> <li>• How do I use RobotC?</li> </ul>	
The basics of RobotC and programming in general.	<ul style="list-style-type: none"> <li>• What is an integer?</li> <li>• What is a loop?</li> <li>• What is an if-statement?</li> </ul>	
KNOWLEDGE	SKILLS	NJCCCS
<p>Students will know:</p> <p>The basic programming techniques to make their robot do the desired task.</p> <p>How to build a basic robot using hand tools.</p>	<p>Students will be able to:</p> <p>Do basic programming to make their robot:</p> <ul style="list-style-type: none"> <li>• Move</li> <li>• Turn</li> <li>• Speed Up</li> <li>• Slow Down</li> <li>• Stay On</li> <li>• Turn Off</li> <li>• Use a Switch</li> </ul>	<p><u>NJCCC Science:</u> 5.1.12.C.1-2</p> <p><u>NJCCC Technology:</u> 8.2.12.A.3 8.2.12.B.1-3 8.2.12.B.5</p> <p><u>NJCCC Safety:</u> 9.2.12 F.1-5</p>

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UNIT II: Programming Using RobotC



SUGGESTED TIME ALLOTMENT	CONTENT-UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
12 Weeks Ongoing	Programming with RobotC  Building a basic robot  Using hand tools  Using motors and sensors  Learning basic programming language	<p style="text-align: center;"><u>Resources:</u></p> <p style="text-align: center;">Teacher generated handouts, Power Point slides, demonstrations</p> <p style="text-align: center;"><u>Suggested Activities:</u></p> <p style="text-align: center;">Programming Quiz Engineering Notebook Basic Robot Objectives Participation</p>

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Unit III: Gears

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS	
What gears are and how they are useful	<ul style="list-style-type: none"> <li>• What are gear teeth?</li> <li>• What direction do gears turn?</li> </ul>	
How we can use gears to accomplish tasks	<ul style="list-style-type: none"> <li>• What is gearing up and down?</li> <li>• What are gear ratios?</li> </ul>	
KNOWLEDGE	SKILLS	NJCCCS
<p>Students will know:</p> <p>How gears can help accomplish goals or objectives.</p> <p>Gears spin in opposite directions when connected.</p> <p>What gear ratios are.</p> <p>What torque is.</p>	<p>Students will be able to:</p> <p>Use various gears to accomplish a goal or objective</p> <p>Successfully identify gear ratios</p> <p>Identify when it's more important to have speed or torque</p> <p>Gear up or down their motors and robots</p>	<p><u>Common Core Math:</u> S-1C.6 G-CO.1 G-MG.3</p> <p><u>NJCCC Science:</u> 5.1.12.C.1-2</p> <p><u>NJCCC Technology:</u> 8.2.12.A.3 8.2.12.B.1-3 8.2.12.B.5</p> <p><u>NJCCC Safety:</u> 9.2.12 F.1-5</p>

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Unit III: Gears

SUGGESTED TIME ALLOTMENT	CONTENT-UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
6 Weeks	<p>Gear Ratios</p> <p>Gearing up and down</p> <p>Torque vs. speed</p>	<p><u>Resources:</u></p> <p>Teacher generated handouts, Power Point slides, demonstrations</p> <p><u>Suggested Activities:</u></p> <p>Engineering Journal</p> <p>Vex Robot</p> <p>Gear ratio quiz</p> <p>Basic robot tasks involving gears</p> <p>Participation</p>

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UNIT IV: Multi-Purpose Robots

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS	
bots can be used to do multiple things at once as long as they are built and programmed correctly	<ul style="list-style-type: none"> <li>• How can my robot move, collect, and shoot foam balls all at the same time</li> </ul>	
KNOWLEDGE	SKILLS	NJCCCS

<p>Students will know:</p> <p>What it takes to make the robot perform all the tasks</p> <p>Program the robot to do all of these things at the same time</p>	<p>Students will be able to:</p> <p>Program the robot as well as the VEX kit's controller to use the robot wirelessly</p> <p>Compete in the swept away competition that puts the students robots against each other</p>	<p><u>NJCCC Science:</u> 5.1.12.C.1-2</p> <p><u>NJCCC Technology:</u> 8.2.12.A.3 8.2.12.B.1-3 8.2.12.B.5</p> <p><u>Common Core Math:</u> S-1C.6 G-CO.1 G-MG.3</p>
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UNIT IV: Multi-Purpose Robots

SUGGESTED TIME ALLOTMENT	CONTENT-UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
8 Weeks	Programming multiple things at once Programming to the VEX controller Building a multi tasking robot	<p style="text-align: center;"><u>Resources:</u>            Teacher generated handouts, Power Point slides, demonstrations, Swept Away Kit</p> <p style="text-align: center;"><u>Suggested Activities:</u>            Swept away competition            Engineering Notebook            Participation</p>

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UNIT V: Robot Wars

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS	
Using all the information from the year to design and build a robot to compete in a competition	<ul style="list-style-type: none"> <li>• What is my competition and what is the best we can build and program it?</li> </ul>	
KNOWLEDGE	SKILLS	NJCCCS
<p>Students will know:</p> <p>RobotC programming</p> <p>Building techniques</p> <p>Gear and motor skills</p> <p>Vex Controller programming</p>	<p>Students will be able to:</p> <p>Use the information given to them throughout the year to build their robot</p> <p>Use their programming skills</p> <p>Use their building skills</p>	<p><u>NJCCC Science:</u> 5.1.12.C.1-2</p> <p><u>NJCCC Technology:</u> 8.2.12.A.3 8.2.12.B.1-3 8.2.12.B.5</p>





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UNIT V: Robot Wars

SUGGESTED TIME ALLOTMENT	CONTENT-UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
8 Weeks	<p>Gear Ratios</p> <p>Gearing up and down</p> <p>Torque vs. speed</p> <p>Programming multiple things at once</p> <p>Programming to the VEX controller</p> <p>Building a multi tasking robot</p> <p>Programming with Robot C</p> <p>Programming Vex Controller</p>	<p><u>Resources:</u></p> <p>Teacher generated handouts, Power Point slides, demonstrations</p> <p><u>Suggested Activities:</u></p> <p>Engineering Notebook</p> <p>Robot Wars Competition</p> <p>Participation</p>

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### APPENDIX A

#### SOFTWARE NAMES:

- RobotC for Vex

#### SUGGESTED WEBSITES:

[www.vexrobotics.com](http://www.vexrobotics.com)

[www.ifirobotics.com](http://www.ifirobotics.com)

[www.usfirst.org](http://www.usfirst.org)

[www.robotc.net](http://www.robotc.net)

<https://www.circuitlab.com/>

<https://imagej.nih.gov/ij/>

### APPENDIX B

#### ASSESSMENT:

#### LIST OF ASSEMENT/TYPE:

Assigned Projects

Optional Projects

Journal Assessment

Formative Assessments including discussions, question/answer, writings

Performance Assessments

Student competition

## APPENDIX C

### SAMPLE INTERDISCIPLINARY UNITS

All topics of study will explore the connections between various disciplines within STEM education. Students will be required to read and analyze articles in addition to writing, thereby including a literacy component. In addition, students will be using technology in the course to construct and share their work.

## APPENDIX D

### PLACEMENT CRITERIA

Any student in the 10<sup>th</sup>, 11<sup>th</sup>, or 12<sup>th</sup> grade that has successfully completed Algebra 1 w/85 average and successfully completed English 1 w/85 average