

Southern Cayuga Central School District – Curriculum Map

Subject: **Robotics**

School Year: **2022-2023**

Title or Topics w/ NYS Standards	Essential Questions & Vocabulary	Content Skills (Activities to cover Essential Questions)	Major Assessments (Tests, Project, etc.)	Time Frame
Unit 1: Introduction to Engineering and STEM <i>NGSS Standards: HS-ETS1-3</i>	What do engineers need to know to design and operate a robotic system to do work? <ul style="list-style-type: none"> • What is technology? • What is engineering? • What is the engineering design process? • What careers involve robotics? • How are Vex components used on a robot? <p><u>Vocabulary:</u> engineering, chassis, bumper angle, motor coupler, spacer, cortex, gear, shaft, range finder, bumper switch, shaft encoder, potentiometer, limit switch, light sensor, line followers, slalom, manipulator, input, output</p>	<ul style="list-style-type: none"> • Paper tower engineering • Orthographic view • Discovery Channel – Robotics Rising • Career connections 	STEM Challenge #1 STEM Challenge #2 STEM Challenge #3 STEM Challenge #4	1-2 weeks

<p>Unit 2: Intro to Robotics Building</p> <p><i>NGSS Standards: HS-ETS1-2, HS-ETS1-3</i></p>	<p>How do parts work together to form a functioning robot?</p> <ul style="list-style-type: none"> • How are motors incorporated into a drivetrain? • How can elevator stages be added for height? • Can linkages have benefits over elevators? • How does passive assistance change the work load of a robot? <p>How can gears be changed for desired speed or power?</p> <ul style="list-style-type: none"> • How is mechanical advantage achieved? <p>How can you configure the joystick to control all motors and mechanisms of a robot?</p> <p><u>Vocabulary:</u> drivetrain, chassis, rotating joints, elevators, linkages, passive assistance, torque, mechanical advantage, gear reduction, passive assistance</p>	<ul style="list-style-type: none"> • Degrees of freedom of a human arm • Elevator lift • Linkage support 	<p>Build: Basic Armbot Challenge: Obstacle Course Challenge: Sack Attack</p>	<p>5 weeks</p>
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<p>Unit 3: Movement and Basic Coding</p> <p><i>NGSS Standards: HS-ETS1-2, HS-ETS1-3, HS-ETS1-4</i></p>	<p>How do programmers design, write, and execute instructions to control a robot?</p> <ul style="list-style-type: none"> • What are robot behaviors? • What are the behaviors of the robot in the simple labyrinth challenge? <p>How do we program a robot to reproducibly travel the same distance?</p> <ul style="list-style-type: none"> • What are encoder sensors and how are they used? <p>How do you program a robot to autonomously straighten its path while traveling forward?</p> <ul style="list-style-type: none"> • What parts of a drive forward program need to be developed further to have the robot travel a straight path? • How can we enable the robot to adjust the power levels of the motors automatically? • How can we use variables to improve our programs? <p>How do you program a robot to perform the same behavior differently?</p> <ul style="list-style-type: none"> • How can we reuse lines of code (for behaviors) multiple times without rewriting the code? • How do parameters expand the utility of functions in the program? <p><u>Vocabulary:</u> labyrinth, encoder, autonomous, automated, variable, loops, value, pseudocode, program, parameters, if/else statement</p>	<ul style="list-style-type: none"> • PBJ activity • Movement and Turn coding • Power levels • Encoder code • If/else statement code • Loop code 	<p>Challenge: Labyrinth code</p> <p>Challenge: Drive straight</p> <p>Challenge: Maze</p>	<p>6 weeks</p>
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<p>Unit 4: Sensors</p> <p><i>NGSS Standards: HS-ETS1-2, HS-ETS1-3</i></p>	<p>How can feedback from a digital touch sensor like a bumper be used to control robotics behaviors?</p> <ul style="list-style-type: none"> • What is the relationship between the status of the touch sensor and the values returned to the Cortex? <p>How can the sonar sensor be used to control robotics behavior?</p> <ul style="list-style-type: none"> • What is the proper wire placement and configuration? <p>How can the light sensor be used to control robotic behavior?</p> <ul style="list-style-type: none"> • What is the threshold value and how is it used with a light sensor? <p>How do we program a robot to use line following to control robot behaviors?</p> <p><u>Vocabulary:</u> bumper, light sensor, sonar, threshold, loops, analog input, digital input, behaviors</p>	<ul style="list-style-type: none"> • Bumperbot Challenge • Sentry II Challenge • Light tag Challenge • Tablebot Challenge • Slalom Challenge 	<p>Build: Soccer Bot Challenge: Maze 2.0</p>	<p>6 weeks</p>
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<p>Unit 5: Control Functions</p> <p><i>NGSS Standards: HS-ETS1-2, HS-ETS1-3</i></p>	<p>What are the commands that can be programmed for wireless control of a robot?</p> <ul style="list-style-type: none"> • How are autonomous and operator control different and alike? • How can we program the robot to perform autonomous tasks while using the wireless remote with operator control? <p>How do while loops and if/else statements work together to cause a robot to perform a desired behavior?</p> <ul style="list-style-type: none"> • <p><u>Vocabulary:</u> RC control, while loop, infinite loop, word circles, button steering</p>	<ul style="list-style-type: none"> • Operator Control Challenge 	<p>Challenge: Pathfollow</p>	<p>3 weeks</p>
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<p>Unit 6: Final Project</p> <p><i>NGSS Standards: HS-ETS1-1, HS-ETS1-2, HS-ETS1-3, HS-ETS1-4</i></p>	<p>How can we incorporate all coding and building skills into designing and building a robot for a one on one challenge in a modified competition field?</p> <ul style="list-style-type: none"> • How can designs be used for offensive/defensive strategies? • How can the autonomous code give a competitive advantage? <p><u>Vocabulary</u>: analysis, pre-autonomous, enable, disable</p>	<ul style="list-style-type: none"> • Engineering notebook 	<p>Final: Swept Away Challenge</p>	<p>3 weeks</p>
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<p>Unit 7: Competition</p> <p><i>NGSS Standards: HS-ETS1-1, HS-ETS1-2, HS-ETS1-3, HS-ETS1-4</i></p>	<p>How can we incorporate all coding and building skills to solve the problem presented by the current Vex VRC Challenge?</p> <ul style="list-style-type: none"> • How does strategic design influence building both on a team and against potential opponents? • How can cost benefit analysis be factored into design and building? <p><u>Vocabulary:</u> analysis, pre-autonomous, enable, disable, platform, elevation, game objects, perimeter, gravity, accuracy, agility</p>	<ul style="list-style-type: none"> • Vex in the Zone • Vex Nothing But Net • Engineering notebook 	<p>Challenge: Current VRC competition</p>	<p>12 weeks</p>
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