Glendale Unified School District

Middle School

July 11, 2023

Department:	Career Technical Education/Industrial Tech
Course Title:	Introduction to Robotics
Course Code:	5471GV
Grade Level(s):	7-8
School(s) Course Offered:	Roosevelt Middle School
UC/CSU Approved: (Y/N, Subject):	N/A
Course Credits:	5
Recommended Prerequisite:	None
Recommended Textbook:	None
Course Overview:	Students will learn the engineering design process while they develop solutions to project-based inquiry learning challenges. Students apply STEM concepts as they research, plan, design, build, and test robots. The learning is virtual and hands-on as they develop coding skills and various engineering concepts.

Unit 1: <u>Introduction and Fundamentals</u> (1 week)

Standards: 1A-AP-10, C9.0 Develop software for a variety of devices, including robotics.
CTE Standards: 6-8.CS.1, 6-8.CS.2, 6-8.AP.10, 6-8.AP.15, 6-8.AP.18, 6-8.AP.19, 6-8.IC.20, 6 8.IC.24

A. This unit shows the value of VEXcode VR (our virtual robot), and EV3/SPIKE Lego Education and how to use the applications. This Unit also outlines the structure for the course, giving you a preview of what is to be expected, and providing you with the tools to be successful. Students will be given virtual challenges for their virtual robot and

specific missions for their EV3/Spike robots.

B. In this unit, students will complete an example project assignment. Students will learn to use the online curriculum and submit their work into a digital platform.

Unit 2: <u>Moving Your Robot</u> (1.5 weeks)
Standards: 1A-AP-10, 1A-AP-11, 1B-AP-12, C9.0
CTE Standards: Develop software for a variety of devices, including robotics, 6-8.CS.2, 6-8.CS.3, 6-8.AP.10, 6-8.AP.12, 6-8.AP.13, 6-8.AP.15, 6-8.AP.19

A. In this unit, students will solve the Castle Crasher challenge to learn how to control basic movements of their virtual robot and apply it to their EV3/Spike robots. Students will learn how to sequence commands correctly using code blocks and/or Python.

B. In Lesson 4, students write code to solve the Castle Crasher Challenge. In this challenge, students will need to sequence behaviors correctly in order to solve the challenge.

Unit 3: <u>Repeating Behaviors</u> (2 weeks)
Standards: 1A-DA-05, 1A-AP-10,1B-AP-10,1B-AP-12,2-AP-17, C9.0 Develop software for a variety of devices, including robotics.
CTE Standards: 6-8.AP.10, 6-8.AP.12, 6-8.AP.13, 6-8.AP.14, 6-8.AP.15, 6-8.AP.19

A. Students will use their artistic skills to solve the Draw a House Challenge using the Pen tool in VEXcode VR. Students will learn to use loops to repeat a set of behaviors multiple times, such as drawing the sides of a square. In addition, students will demonstrate their understanding by using loops to control their EV3/Spike robot to accomplish a similar mission.

B. In Lesson 2, students solve a mini challenge on the Art Canvas Playground, by finding errors in a given project and modifying it to work successfully.

Unit 4: <u>Navigating a Maze</u> (2 weeks)
Standards: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-15, 2-CS-02, C9.0 Develop software for a variety of devices, including robotics.
CTE Standards: 6-8.AP.10, 6-8.DA.7, 6-8.DA.8, 6-8.AP.12, 6-8.AP.13, 6-8.AP.14, 6-8.AP.15, 6-8.AP.19

A. This unit will enable students to use sensor input to navigate the VR Robot and the EV3/Spike robot regardless of its surroundings. This is an important step in being able to develop effective algorithms. Students will learn to use the bumper sensor in their VR robot as well as their EV3/Spike robot using conditionals in their code.

B. Throughout this Unit, students build a project to navigate the Wall Maze using sensor

data from the Bumper Sensor and [Wait until] blocks, with Drivetrain commands. By the end of the Unit, students have created multiple projects that include sequence, loops, and conditionals in order to successfully navigate to different places in the Wall Maze.

Unit 5: <u>Detecting Walls from a Distance</u> (2.5 weeks)
Standards: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-15, 2-CS-02, C9.0 Develop software for a variety of devices, including robotics.
CTE Standards: 6-8.AP.10, 6-8.AP.12, 6-8.AP.13, 6-8.AP.14, 6-8.AP.15, 6-8.AP.19

A. Students will navigate the VR Robot from start to finish through a wall maze using a distance sensor without touching the walls of the maze. The combination of comparison blocks and the distance sensor will be useful to solve this mission. The ultrasonic sensor in the EV3/Spike robots will also be required to navigate all around the competition field.

B. Throughout this Unit, students build a project to navigate the Wall Maze using sensor data from the Distance Sensor and [Wait until] blocks, with Drivetrain commands. By the end of the Unit, students have created multiple projects that include sequence, loops, and conditionals in order to successfully navigate to different places in the Wall Maze.

Unit 6: <u>Knowing Your Location</u> (2 weeks)
Standards: 1B-AP-10, 1B-AP-11,1B-AP-12, 1B-AP-15, 2-CS-02, 1B-AP-17, C9.0 Develop software for a variety of devices, including robotics.
CTE Standards: 6-8.DA.8, 6-8.AP.10, 6-8.AP.12, 6-8.AP.13, 6-8.AP.14, 6-8.AP.15, 6-8.AP.19

A. In this unit, students will complete the Drive to Three numbers challenge using the location sensor in the VR Robot on the number grid map playground. Students will use their understanding of the coordinate plane to program the robot to drive to specific locations on the number grid map.

B. In Lesson 4, students apply commands from the Drivetrain, Sensing, and Control categories in the correct sequence in order to have a VR Robot successfully navigate to three numbers on the Number Grid Map using the Location Sensor and their knowledge of (X, Y) Coordinates. To solve the challenge students will need to break down the task into smaller behaviors in order to successfully build a project to solve the maze.

Unit 7: <u>Decisions with colors</u> (2.5 weeks)
Standards: 2-AP-10, 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-15, 2-CS-02, 1B-AP-17, C9.0 Develop software for a variety of devices, including robotics.
CTE Standards: 6-8.AP.10, 6-8.AP.12, 6-8.AP.13, 6-8.AP.14, 6-8.AP.15, 6-8.AP.19

A. Students will be introduced to the importance of conditional statements such as if/then along with conditional loops to program the VR robot. They will use the eye sensor to

detect disks of various colors to complete the Disk Maze challenge. In addition, students will use the light sensor on the EV3/Spike robots to make decisions with lines on the competition field.

B. Throughout the Unit, students use comments in their project to describe the intention for the VR Robot's behavior, describing the steps of the complex problem of navigating the Disk Color Maze using the Front Eye Sensor using algorithmic thinking.

Unit 8: <u>Moving Disks with Loops</u> (2.5 weeks)

A. In this unit, students will learn about the importance of sensor feedback and nesting loops. Students will use the electromagnet on the VR robot to pick up and drop disks to solve the Disk Mover challenge. Students will need to use their knowledge on sensors and loops learned in previous units to solve the Disk Mover challenge.

B. Throughout the Unit, students use comments in their project to describe the intention for the VR Robot's behavior, describing the steps of the complex problem of moving disks with the Electromagnet and various sensor feedback using algorithmic thinking. 2-AP-10, 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-15, 2-CS-02, 1B-AP-17, 2-AP-12, C9.0 Develop software for a variety of devices, including robotics. 6-8.AP.10, 6-8.AP.12, 6-8.AP.13, 6-8.AP.14, 6-8.AP.15, 6-8.AP.19

Unit 9: <u>Developing Algorithms</u> (2 weeks)
Standards: 2-AP-12, 2-AP-10, 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-15, 2-CS-02, 1B-AP-17, 2-AP-17, C9.0 Develop software for a variety of devices, including robotics.
CTE Standards: 6-8.DA.9, 6-8.AP.10, 6-8.AP.12, 6-8.AP.13, 6-8.AP.14, 6-8.AP.15, 6-8.AP.19

A. This unit introduces students to algorithms. Students will need to solve the Dynamic Castle Crasher challenge. The layout changes every time the playground is reset. In this case, students will need to develop an algorithm that uses sensor feedback instead of a sequence of simple commands.

B. Throughout this Unit students learn about using nested loops to build an algorithm to successfully crash castles on a dynamic playground. They will repeatedly design and iterate on their projects to use multiple sensors to detect castles and the border of the Playground in order to solve the Dynamic Castle Crasher challenges.

Additional Recommended Materials –

Lego Education Spike Prime Set: https://education.lego.com/en-us/products/lego-education-spike-prime-set/45678

VEXcode VR Curriculum: https://education.vex.com/stemlabs/cs/cs-level-1-vexcode-vr-blocks

VEXcode VR online access: https://www.vexrobotics.com/vexcode/vr

First Lego League Competition Kit:
https://www.firstinspires.org/robotics/fll/challenge/pricing-and-payment