

CURRICULUM GUIDE

SUBJECT: Robotics

GRADE: 7th/8th GradeTIMELINE: 1st Quarter

Standard	Kid Friendly Learning Objectives	Content (subject or topic covered in Journeys/My Perspectives)	DOK Level	Skills (ability, practice, aptitude that will be learned)	Assessment	Academic Vocabulary
Introduction to TMS Robotics	I will learn the academic and safety expectations of a Robotics classroom.	Introductions, Classroom Expectation, Classroom Contract, Syllabus, Hand book, Composition Book	1	Introductions/ Classroom Expectation, Classroom Contract, Syllabus, Hand book, Composition Book	Students will carry out a hazard and risk assessment for the classroom.	Expectations Hazard Safety
Introduction to zSpace Studio, Newton's Park, Franklin's Lab	I will manipulate zSpace Studio, Newton's Park, Franklin's Lab using 3-D glasses and stylus.	Students will watch How to: zSpace Studio (4:03) zSpace Studio 2 (2:45) zSpace Studio 3 (2:42)	1	zSpace Studio Quick Start Guide: manipulate an object 180°, increase and decrease the size of an object	Welcome to zSpace zSpace Demo – Scavenger Hunt	Simulator
Standard 8.0 Identify Industrial robot Types and the Tasks they Perform 8.4 Simulate a solution	The SWBAT apply the engineering design process to design and create solutions.	zSpace Franklin's Lab "Engineering Design Process: Middle School"	2	Students will learn how they can use the engineering design process to find solutions to real-world problems.	Engineering Design Process: Middle School Worksheet Engineering Notebook	Engineering design process Constraint Criteria Engineer Optimize
Standard 12.0 Develop Robotics Application Systems 12.8 Demonstrate a methodical approach to process development.	The SWBAT demonstrate how classical mechanics is used in the engineering process.	Unit 1 Introduction to Engineering Day 1 – 9 (7 days)	1	Students will learn about what engineering is and what engineers do. The concepts of classical mechanics, design and iteration will be defined and worked through.	Engineering Notebook Assessment of Vocabulary Unit 1 Pre/Post Test	Engineering Methodical Classical mechanics Structural Design Manufacturing Design Innovation Quantitative Specifications Ideate Prototype

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						CAD Models Assembly Drawings Manufacturing Plans Bill of Materials Maintenance Guide User Manuals Design Presentations Proposals Design Review Iterate Engineering Notebook
Standard 1.0 Examine the Impact of New Technologies on Automation and Robotics 1.1 Describe the principles, processes, and practices of AI (artificial intelligence), ML (machine learning), and RPA (robotic process automation) 1.2 Discuss how the application of AI, ML, and RPA have changed existing business (i.e.	The SWBAT discuss how robots are used today in industry, research and in education. The SWBAT explain what the different basic components of a robot are and how they perform their functions.	Unit 2 Introduction to Robots (Day 1-7)	2	Students will learn about how the field of robotics operates and how robots work. Students will learn about the role of robots in society and how they are used in all aspects of STEM education.	Unit 2 Pre/Post Test Assessment of Vocabulary Engineering Notebook	Robot Robotics Subsystem Manipulators Control System Sensors Central Process Unit (CPU) Drivetrain Actuators Servo Ultrasonic Range Finder

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enhanced efficiency, increased work performance, reduced human error, simplified interactions, speedier processes, improved customer experience, etc.) 1.3 Give examples of how AI, ML, and RPA are used in services, manufacturing, agriculture, and healthcare [i.e., social media, virtual/personal assistant (Alexa and Siri), financial fraud detection, self-driving cars, medical diagnosis and prediction, etc.]						Gyroscope Light Sensor Optical Encoders Microcontroller Autonomous
Standard 12.0 Develop Robotics Application Systems 12.4 Develop or reuse software components (i.e., modular software design, etc.)	The SWBAT explain what the specific components that make up the VEXnet System can do and how they are used to control the robot. The SWBAT set up their microcontroller to function in both autonomous and drive controlled modes.	Unit 3 Introduction to VEXnet (Day 1-6)		Students will learn what the core components of the VEX control system are – the Cortex Microcontroller, VEXnet Joystick and VEXnet Wireless link. They will also learn how they each function.	Unit 3 Pre/Post Test Assessment of Vocabulary Engineering Notebook	Microcontroller Bi-directional communication Debugging Downloading Interface Autonomously Jumpers

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Standard 8.0 Identify Industrial Robot Types and the Tasks they Perform 8.2 Measure robotic performance against specified criteria	The SWBAT develop a list of 10 functions they will demonstrate using the clawbot.	Clawbot completion	2	Students will demonstrate their proficiency on controlling Clawbot.	Student created test	
Standard 12.0 Develop Robotics Application Systems 12.10 Describe robotics project constraints (i.e., timeline, budget, environment, skill level, etc.)	The SWBAT explain how the process of strategic design works. The SWBAT demonstrate the use of defining objectives to select game objectives. The SWBAT list all of the ways to score the most points in the game. The SWBAT create a cost – benefit analysis to demonstrate the strengths of different tasks.	Unit 5 THE GAME! (Day 1-5)	2	Students will learn the rules of the game, which will be necessary to design robots. The students will be able to analyze potential game strategies. Students will learn the effects of applying a cost benefit analysis to the design process.	Unit 5 Pre/Post Test Assessment of Vocabulary Engineering Notebook	Strategic Design Defining Objectives Cost Benefit Prioritization
Standard 3.0 Analyze Hydraulic and Pneumatic Systems 3.1 Describe the relevance of material properties to robotics (e.g., inertia, velocity, mass, density, and strength) Standard 7.0 Perform Drafting Tasks	The SWBAT demonstrate the basic concepts of manipulators and accumulators. The students will be able to design examples of each.	Unit 6 Object Manipulation (Day 1-8)	1	Students will learn about the different types and categories of robot manipulators. Students will be presented with robot manipulators from the real world, and shown the basic principles behind their operation. Students will then create their own object manipulator for use on their	Unit 6 Pre/Post Test Assessment of Vocabulary Engineering Notebook	Manipulators Plow Scoops Traction Friction Claw Elasticity Accumulators Conveyor Magazine

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7.7 Interpret electrical drawings and architectural plans.				competition robot.		Indexing Hopper Conveyance
Standard 5.0 Describe the Operation and Use of Various Forms of Electrical Motors 5.1 Explain the “safety by design” concept to ensure operator and workspace safety. 5.2. Explain the operation and use of DC motors in automation controls. 5.6 Describe how servos are used in automation and robotics (e.g., robot arms, legs, and steering)	The SWBAT explain the difference between speed, power and torque. The SWBAT demonstrate the concept of speed, power, torque.	Unit 7 Speed, Power, Torque & DC Motors (Day 1-10)	2	Students will learn about the physical principles of speed, power, and torque. Students will learn about DC motors and how these principles apply to them. Students will apply these concepts on a sample mechanical system to calculate key details of the design.	Unit 7 Pre/Post Test Assessment of Vocabulary Engineering Notebook	Methodical Engineering Mechanics Speed Rotational Speed Acceleration Force Work Power Torque Velocity Actuator DC Motor Voltage Current Stall Load
Standard 2.0 Perform Electrical and Electronic Tasks 2.1 Troubleshoot voltage, current, and power in AC and DC circuits (i.e., fuse, continuity, etc.) 2.3 Identify and troubleshoot components	The SWBAT explain the difference between a conductor and an insulator. The SWBAT close a circuit using some conductive and some nonconductive materials.	zSpace Franklin’s Lab Investigation: Conductivity	2	Students will evaluate the conductivity of the various materials by determining which materials allow electrical current to flow through the circuit smoothly.	Investigation: Conductivity Worksheet	Circuit Closed Circuit Components Conductive Electricity Insulator Nonconductive Open Circuit

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and connections.	The SWBAT observe how energy can be transferred through conductive materials in a circuit.					