Robotics II
Overview
2022 - 2023

This document is designed to provide parents/guardians/community an overview of the curriculum taught in the FBISD classroom. This document supports families in understanding the learning goals for the course and how students will demonstrate what they know and are able to do. The overview offers suggestions or possibilities to reinforce learning at home.

Included at the end of this document, you will find:

- A glossary of curriculum components
- The content area instructional model
- Parent resources for this content area

To advance to a particular grading period, click on a link below.

Process Standards

The process standards describe ways in which students are expected to engage in the content. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use knowledge learned efficiently and effectively in daily life.

(4) Critical thinking, problem solving, and decision-making. The student makes informed decisions by applying critical-thinking and problem-solving skills. The student is expected to:
(A) identify and define relevant problems and significant questions for investigation;
(B) plan and manage activities to develop a solution, design a computer program, or complete a project;
(C) collect and analyze data to identify solutions and make informed decisions;
(D) use multiple processes and diverse perspectives to explore alternative solutions;
(E) make informed decisions and support reasoning; and
(F) transfer current knowledge to the learning of newly encountered technologies.

Grading Period 1

Unit 1: Advanced Applications of Algorithms

Estimated Date Range: 8/10 - 10/7
Estimated Time Frame: 41 Days

Unit Overview: Students will build off of the problem solving skills that they learned in Robotics 1. This unit will focus on teaching students how to think or to "think about the thinking." This will be done by students focusing on computational thinking as well as the Engineering Design Process. Students will see how a set of steps can be used to solve a problem through a variety of tasks. In this Unit, students will also be introduced to a variety of Electrical Engineering Concepts and will have the opportunity to design simulated circuits as well as build out circuits using an Arduino Board. Students will finally apply their learning of the Engineering Design Process to engineer a variety of solutions to different problems using the algorithms and the Lego EV3s.

At home connections:

- Discuss ways that tasks are completed, baking a cake, planning a vacation, building a house.
- As driving around, ask students about construction they see happening. Pose questions about what impact they think building the structure has on the area and the role that engineers play in helping the construction to follow laws and protect all interested parties.

Concepts within Unit #1 Link to TEKS	**Success Criteria for this concept**
Concept 1: Computational Thinking (9 days) • Lesson 1: Intro to computational thinking (2 days) • Lesson 2: The Engineering Design Process with Bridge Challenge and Rube Goldberg Machine (7 days)	• I will explain how engineers uses computational thinking to create products. • I will use the Engineering Design Process to develop solutions to a problem • I will create a series of steps to solve a problem
Concept 2: Problem Solving with Exploring Electrical Engineering (15 Days) • Lesson 1: What is Electricity? (4 days) • Lesson 2: Circuitry with Motion (5 days) • Lesson 3: Circuitry with Display (6 days)	• I can create algorithms that solve problems in Electrical Engineering. • I can design a simulation that shows different concepts of electricity. • I can use a circuit board and breadboard to demonstrate concepts of electricity.
Concept 3: Futuristic Engineering • Kit Organization, Lego Classroom Overview (1 day) • Lesson 1: Precision with Gears and Torque (5 days) • Lesson 2: Incline and Slope (5 days) • Lesson 3: Careers in Robotics (3 days)	• Develop a plan with my team that solves a problem • Build my EV3 and the necessary parts to complete the Design Challenges • Communicate and collaborate with my team to identify solutions to and complete the Design Challenges. • Program my EV3 to complete the Design challenges. • Modify a robot build to complete the Design Challenges • Create and program a robot that can complete the Design Challenges

Grading Period 2

Unit 2: Advanced Robotics Programming

Estimated Date Range: 10-/11 - 12/16
Estimated Time Frame: 43 days

Unit Overview: In this unit, students will learn about the science of Engineering and how to collaboratively work as part of a team to develop team building skills through communication and cooperation. Students will research the planet Mars in addition to the variety of spacecrafts that have landed on Mars. Students will continue building and expanding algorithmic and engineering skills learned in Robotics 1 with the EV3 Robot. Students will complete a variety engineering challenges, the design brief and presentations with a focus on the engineering design process in robotics. Students will also participate in a variety of engineering activities where they learn concepts such as gear ratios, torque and gravity.

At home connections:

- Hobby stores have several low-cost robot kits that can be purchased and assembled to build upon the learning from class. Though the kits come with the design, students can apply their learning to build upon the robot's and modify them to complete other tasks or movements.
- Encourage students to visit the NASA website and learn about the various mission that are currently active and careers that are related that go beyond just what we see on TV or during a launch and how robots are being used in these missions.

Concepts within Unit # 2 Link to TEKS	**Success Criteria for this concept**
• Concept 1: Evaluating Algorithms with EV3 Robotics Space Challenges (43 days) • Lesson 1: Exploration of EV3 Robot (Build, Motion, Sensor, Variables, Iterations) (17 days) • Lesson 2: Engineering Labs (Gyro and Color Sensor) (15 days)	• *Develop a plan with my team to build, test and program my EV3 Robot.* • *Create programs and robot builds that will accomplish the Space Challenge tasks with in the allotted time frame.* • *Explain my builds and plan to an audience and why it worked.*

• Lesson 3: Applying Algorithms - Space Challenges (11 days) •	

Grading Period 3

Unit 3: Exploration of the Engineering Design Process

Estimated Date Range: 1/5 - 3-10
Estimated Time Frame: 44 days

Unit Overview: In this unit, students will continue to learn to communicate and collaborate on robot design and programming. Students will learn how programmers solve problems in coding, design, and how they find out of the box solutions to their given tasks. Students will learn that there are multiple strategies and solutions to solve the problem; working as a team to find the best solution to fit the situation is what engineers and programmers do. Students will also learn about various food sciences and environmental sciences and the impacts on society.

At home connections:

- Have students look for examples of robotics in their home or town. Items such as the Roomba vacuum or even a car wash uses robotics component to complete a task. Discuses with students what is necessary for that product or service to work successfully.
- Have students design a water filtration system that filters dirt / mud / silt to get as clean as water as possible.

Concepts within Unit # 3 Link to TEKS	Success Criteria for this concept
Concept 1: EDP with Advanced Applications and Algorithms (12 days) • Lesson 1: Parking Garage Challenge (6 days) • Lesson 2: Prosthetics and Mechanical Arm (6 Days)	• Build my EV3 and the necessary parts to complete the Design Challenges • Communicate and collaborate with my team to identify solutions to and complete the Design Challenges. • Program my EV3 to complete the Design challenges. • Use the Engineering Design Process to design a prosthetic
Concept 2: Exploring Chemical and Environmental Engineering using the EDP (34 days) • Lesson 1: Fundamentals of Food Science (6 days) • Lesson 2: Fundamentals of Chemical Engineering (5 days) • Lesson 3: Fundamentals of Environmental Engineering (6 days) • Lesson 4: Innovations and EDP in Chemical and Environmental Engineering (7 days) • Lesson 5: Careers in Chemical and Environmental Engineering	• I can explore a variety of ways to identify a problem. • I can explore how various engineers identify and solve problems that impact the environment. • I can create a prototype of an object that solves a problem.

Grading Period 4

Unit 4: Application of Engineering Design in Aeronautical Engineering

Estimated Date Range: 3/21 - 4/22
Estimated Time Frame: 23

Unit Overview: Students will explore aeronautics and how engineering works with the science to build machines of flight. From learning about various components and skills such as wings and lift, students will design, build, and refine a product that can fly.

At home connections:

- Search for paper airplane designs online. Have students create and test the action of the different types of wings on the paper airplanes.
- Search for the history of flight and look at how airplanes have evolved over time. What components of planes have stayed the same and what have changed? Why do you think some things stayed and others changed? What does this have to do with the science of flight? How have materials changed and what impact does this have on flight?

Concepts within Unit # 4 Link to TEKS	Success Criteria for this concept
Concept 1: Flight	• Use precision measurements to design, cut and assemble the parts of a glider • Build a working glider using specs from a glider simulator • Create a working glider that will fly • Manipulate a simulator to design and modify a glider to achieve an optimal flying time

Unit 5: Exploration and Invention

Estimated Date Range: 4/25 – 5/26
Estimated Time Frame: 20

Unit Overview: Students will work with various peripherals that coordinate with coding programs. Through the connections of these peripherals and coding students will see how the two sets of tools and skills work together to create real world products. Using coding languages, students will make real world connections between the digital world and products that they used on an everyday basis.

At home connections:

- Have students consider the connection between items such as a remote control or touch screen pad and how the coding works with the peripheral to function. If possible and a remote or device is being discarded, allow students to take apart to examine how it is designed and the connection between the peripheral and the coding.
- Scratch allows students to create simple games and there are several types of peripheral kids that students can use that lets them create controllers or other devices to use with their games.

Concepts within Unit # 4 Link to TEKS	Success Criteria for this concept
Concept 1: Exploring Coding Tools (24 days) • Lesson 1: Exploration of coding tools (10 days)	• *Students will use one or more hardware systems to create a product or prototype* • *Students will create algorithms on one or more pieces of hardware to solve a problem.*

• Lesson 2: Solving a Problem using EDP- Design own task with their choice of tool (Shark Tank) (12 days)	• *Students will use the Engineering Design Process and create a prototype to solve a problem.*

Glossary of Curriculum Components

Overview– The content in this document provides an overview of the pacing and concepts covered in a subject for the year.

TEKS – Texas Essential Knowledge and Skills (TEKS) are the state standards for what students should know and be able to do.

Unit Overview – The unit overview provides a brief description of the concepts covered in each unit.

Concept – A subtopic of the main topic of the unit.

Success Criteria—a description of what it looks like to be successful in this concept.

Competency—Standards-Based Grading communicates students' understanding of the Texas Essentials Knowledge and Skills (TEKS). Using the TEKS, teachers developed grade-level competencies to communicate student progress in the Standards-Based gradebook. The competencies are the same for each grade-level content area (i.e. 1st grade math) across the district. Teachers report students' progress on the competencies using learning progressions.

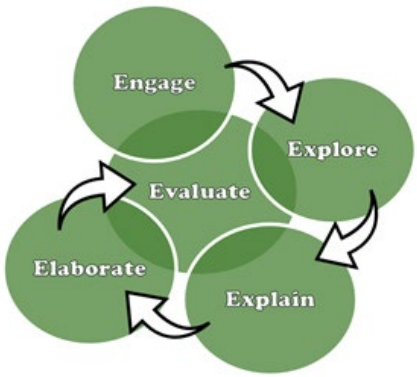
Parent Resources

The following resources provide parents with ideas to support students' understanding. For sites that are password protected, your child will receive log-in information through their campus.

Resource	How it supports parent and students
Discovery Education	This online resource provides access to a wide variety of videos to help in learning more about engineering concepts. .
Britannica School	This is an information resource for students. It has encyclopedia articles, multimedia, primary sources, games, and other learning resources that support student learning.
Ebsco Host	This online reference system serves all content areas.
Maps 101	This online resource provides access to access to maps, animations, videos, games, & activities that may be used when looking at engineering careers and where they are most prevalent
World Book	World Book contains thousands of informational articles with stunning illustrations, videos, interactive maps, and activities.
Scratch	This is a website created by MIT that is used to teach block coding concepts.

Instructional Model:

The Instructional Model for Robotics and Engineering I is the 5E Model. The 5E model lesson cycle consists of engage, explore, explain, elaborate and evaluate. In Robotics and Engineering I, students utilize multiple class periods to navigate through this cycle.



Engineering Design Process:

In addition, Robotics and Engineering I uses the Engineering Design Process. Students will engage with this model to find solutions to real-world problems. The steps that are used in the Engineering Design Process are: Ask, Imagine, Plan, Create, Test, Improve and Share.