

## **Robotics I Spring 2023**

*Northwest Cabarrus High School*

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Welcome to Robotics I! In this course, you will be introduced to the world of Robotics, and construct and program your own robot.

### **Policies:**

Grades in this course will be based on mastery of course content (assignments & tests) as well as active participation in class activities and projects. I will make accommodations as needed, please contact me if you need to discuss them. Students will have a one week grace period to turn in any late assignment without penalty. After a week, students will lose 5 points per day that an assignment is late.

If you are ever absent, please check out Canvas for any work you may have missed, and definitely speak to me if you have any concerns about work you've missed, or if you have questions about your grades or the class in general. I am reachable by email, and also via Remind.

During this course, students will work with hands-on projects. They will use electrical batteries and motors, as well as build gear trains with moving parts. They will also use simple tools, including ones with sharp blades. Before any activity, students will review safety procedures, but some risk is inherent in using robots. Please contact me if you have any questions or concerns about your student using simple tools.

### **Course Overview:**

#### **Unit 1: The Robot**

In Unit 1 students are introduced to the world of robotics. It reviews fundamental robotic terms and concepts required throughout the course. The student learns about the engineering design cycle and how to record information into an engineering notebook. An entire section in Unit 1 is dedicated to safety in the

classroom.

As the student progresses through the unit, they will be constructing their first Vex robot, the BaseBot. They will learn how to use basic assembly tools as well as how to identify available Vex robotic components from the classroom inventory system. The BaseBot construction is broken down into subsystems like chassis, drive train,

wiring and wireless control.

After the robot is constructed, the students test and troubleshoot their creation. They learn how to operate their robot using radio control in both Arcade and Tank style. The final project challenges them to draw their initials or first name on the playing field using the BaseBot and a dry erase marker. We will have other challenges and projects throughout the class.

Students will learn:

- How to navigate the course
- Fundamental robotics terms and concepts used throughout this course
- The engineering design cycle
- How to set up and record information into their engineering notebook or an Excel spreadsheet
- The guidelines for safety in the classroom

## **Unit 2: The Code**

Unit 2 introduces the student to programming. VEXcode V5 text is the program used to control the Vex robot in this course. The student is shown the differences between operator control of the robot and autonomous control. The student learns how to connect the BaseBot to the computer and control it via the program debug window. Students are challenged to create pseudo code for their programs before trying to create real programs in order

to better understand the concept of programming flow. We will also delve into programming the VEX virtual robots online ([vr.vex.com](http://vr.vex.com)).

Fundamental programming concepts like loops, statements, variables, constants and assignments are reinforced with activities and worksheets. Students learn how to create simple programs to command the robot to go forward, backward, left and right. They learn how to simplify their code using functions. We will work together to design a final unit project.

Students will learn:

- Fundamentals of computer programming
- Fundamentals of programming with VEXcode
- Fundamental programming concepts like loops, statements, variables and constants
- Precedence of operations
- How to describe a process using pseudo code
- How to simplify code with functions

## **Unit 3: The Physics**

Unit 3 is the longest unit in the first semester as well as the most academic. It reviews many fundamental physics concepts such as speed and torque and shows how they apply to robotics. Students will learn about motors and how they are used in robotics. Time is spent testing the Vex motors on the Basebot and logging performance information into the engineering notebook for future use. Topics like angular velocity, linear motion, gear ratios, weight, friction, torque and acceleration are all introduced and reinforced with activities related to robotics. We will work together to design a final unit project.

Students will learn:

- The fundamentals of motors and angular velocity
- The different types of motors and the power sources they use
- The principles of physics involved in gears and gear trains
- The physics involved with motion along a straight line including speed and acceleration
- The fundamentals of rotational dynamics
- Newton's laws of motion
- How friction and traction interact with one another and a robot
- The fundamentals of torque
- About power as it relates to robotics