Introduction to Robotics

Course Description

This beginning robotics course uses VEX EDR Robotics parts and VEX Code software to introduce the student to basic programming as well as problem solving strategies incorporating skills such as decomposition, pattern recognition, algorithmic thinking, and abstraction. This course will use discovery learning methodology to engage students in the development, building and programming of robots to accomplish various tasks. Students will work hands-on in teams to design, build, and program robots as well as document their progress using an engineering notebook. Topics may include motor speed, gear ratios, torque, sensors, program loops, project documentation and decision-making. Students have the opportunity to work as a project manager, a builder, and a programmer throughout each project.

Course Objectives

- Design robots and use VEX Code software for specific activities and scenarios
- Use and analyze gear ratios related to speed and torque
- Understand the ability and limitations of programming robots
- Understand and explain programming concepts such as decomposition, pattern recognition, algorithmic thinking, and abstraction
- Collaborate in groups and teams to use problem solving skills to solve real world applications

Assessment

Students are assessed through quizzes and group projects focused on building design, programming, and project management skills.

Equipment	Cost/Unit
VEX Parts (Classroom Super kit)	V5 Classroom Super Kit: $1200 each (1 set/3 students)
Computers to Run Visual Coding Studio	$0 if you already have some, $500-600 per computer if you need to purchase

First Semester Outline:

Unit 1: Robotics Building Basics	Safety, Parts Identification, Build a basic clawbot
Unit 2: Gears and Drivetrain speed	Motor Mechanics, Gear Ratios, Wheels and Drivetrains
Unit 3: Gears and Manipulator Torque	Throwing Mechanisms, Torque
Unit 4: Lift Design and Accumulators	Research and Build Lift Design and Accumulators
Unit 5: Programming Basics and variables	Documenting the Process, Basic programming structure, Commenting code, Basic commands, Understand Variables in programming

Second Semester Outline:

Unit 6: Sensors	Types of Sensors, Application of Sensors
Unit 7: Navigation	Navigation and turning
Unit 8: Auto-straightening, if statements and function	Accelerate with autos-straightening, Basketball Slalom Drill, Understand functions in programming
Unit 9: Bump Sensors	Sentry simulation, Bump into a wall
Unit 10: UltraSonic Sensors*	Robodunk using Ultrasonic Sensor to detect distance away
Unit 11: Vision Sensor*	Three part exploration of the capabilities of the vision sensor
Unit 12: Final Project	Using all sensors, build a robot within the design parameters that can successfully navigate through a mystery maze

***Optional units if time permits - otherwise skip to final project**

INTRODUCTION TO ROBOTICS (VEX)

1. Materials
   A desktop or laptop computer, access to 1-to-1 daily, and Internet. Chromebooks will not work.

Hardware/Reusable Material	Recommended Unit	Cost/Unit
V5 Classroom Starter Kit	1 per 3-4 students	749.99
Storage Bin, Lid & Tray	1 per 3-4 students	34.99
Tool Kit V2	1 per 3-4 students	8.99
Software (Each student needs access to a computer)		
VEX Code V5 (Must include Text Based Programming)	1 per student	Free

2. Required software, networking access, and access to LSU servers
   VEXCode software will need to be installed in computers. *It will not work on chromebooks.*
3. Required teacher collaborations
   Teachers will communicate with LSU instructors via email and shared Google Drive folder. Teachers will need to share sample student work with their designated LSU Pathway Point-of-Contact.
4. Required administration of course content, pre/post test, and research instruments
   All required materials and instruments will be either posted in a Google drive or their location announced via email
5. Course Work
   Teachers must present the course material in sequence or as approved by collaboration with the LSU Pathway Point-of-Contact. Teachers are expected to deliver a minimum of 80% of the course material.
6. Other
   As this is a project-based learning class, we strongly suggest that each section of the course be limited to a *maximum* of 20 students. If the course is overloaded with students, they will not receive adequate instruction.