Fairfax Collegiate

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Competitive Robotics 7-9 Syllabus

Course Goals

1 Understand Advanced Programming Logic and EV3
Students learn how to program mobile robots using the EV3 programming language and learn about advanced principles of robotic design and implementation.

2 Refine Engineering and Problem-Solving Skills
Students apply what they learn about robotics and programming to complete complex challenges using the EV3 platform. They work in teams to complete these challenges and create complex robotic behaviors.

3 Develop Competition Experience and Strategies
Students are challenged by the instructor and other students to refine their abilities in programming and robotic design.

Course Topics

1 Competition Strategies
Students test and refine ideas through competition, challenges, and teamwork.

2 Robotics Design Principles
Students learn about gear ratios, stability and center of gravity, articulation and motorized limbs, optimum sensor placement, relative advantages of wheels, treads, bipedal, and tripedal designs.

3 Sensors and Feedback
Students use tilt, color, ultrasonic, and touch sensors. They learn about sensor input, feedback, math, and sensor programming blocks.

4 EV3 Programming
Students use the EV3 Programming language, custom programming blocks, control loops and datawires, Bluetooth messaging connections, programming sequences, and logic.

5 Geometry and Navigation
Students improve their robots through measurement and course planning, angles and turn calculations, types of turns, obstacle avoidance, and line following.

6 Problem Solving
Students improve their problem solving skills by assessing the challenge, brainstorming solutions, cooperative planning, trial and error, and delegating team member responsibilities.

Course Schedule

Day 1
Class Welcome
Students are introduced to each other and form the groups they'll be working in over the course of the class.

Build Taskbot
Students begin to build the EV3 TaskBot once successfully grouped.

Lesson: Keeping a Design Journal
Students go over the basics of the workbook and learn how to organize their thoughts before building and programming and reflect on the concepts they learned after each activity.

Lesson: Programming Basics
Students learn the movement block options available in EV3, as well as the switch and loop blocks.

Day 2
Activity: Movement Checklist
Students go through the 8 different exercises in the workbook for movement.

Activity: Turns Checklist
Students complete the checklists and get familiar with accurate turns.

Lesson: Introduction to Sensors
Students learn about the different sensor control options available to them.

Activity: Sensor Checklist
Students complete the sensor checklist and get familiar with different options available to them.

Day 3
Challenge: Two Button Remote Control
Students test their knowledge of the flow control options and create a two-button remote control for the TaskBot.

Activity: Ultrasonic Maze
Students use the ultrasonic sensor to navigate through a maze.

Day 4
Lesson: Gear Ratios
Students learn about gear ratios and use this knowledge to modify their vehicles.

Challenge: Drag Race
Students customize their robots and the gear ratios of their robots to compete in a drag race.

Challenge: Trash Bot
Students push out trash or other items from an arena using a combination of the ultrasonic and color sensors.

Day 5
Challenge: Sumo
Students customize their robots for combat.

Lesson: Data Wires
Students learn the more complicated aspects of EV3 programming.

Day 6

Activity: Rock, Paper, Scissors
Students program a robot that can play Rock, Paper, Scissors using data wires.

Lesson: Reaction Time Game
Students walk through data wires and variables to create a simple game using the EV3 brick.

Lesson: Bluetooth
Students learn about Bluetooth controls and programming.

Day 7

Challenge: Mario Kart Racing
Students race each other through a course designed by their instructors using Bluetooth connections.

Day 8

Challenge: RoboCup Soccer
Students form teams and play soccer using their robots.

Day 9

Challenge: Battle Royale
Students customize a robot to fight in a challenge that they design.

Day 10

Class Wrap-Up
Students review the design, programming, and scientific material they've covered in the course. Students disassemble their robots, inventorying their kits in the process.

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