Fairfax Collegiate

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Robotics Engineering 5-6 Syllabus

Course Goals

1 Intermediate Principles of Mechanical Engineering
Students learn about engineering principles such as torque, force, mechanical advantage, and gear ratios using EV3. They apply these to design and modify Lego robots.

2 Understand Programming Using the EV3 Language
Students learn how to program mobile robots using the EV3 programming language and how to utilize sensor feedback systems for conditional logic.

3 Advanced Engineering and Problem-Solving Skills
Students apply measurement and geometry to optimize robot navigation and path planning and work in teams to develop creative robots and solutions for challenges. They integrate what they learn about sensors, programming, and robot design to create complex robot behaviors and builds.

Course Topics

1 Engineering principles
Students learn about force and torque, leverage, mechanical advantage, electricity and energy, and electrical motors.

2 Robotics design principles
Students learn about gear ratios, stability and center of gravity, articulation and motorized limbs, optimum sensor placement, and relative advantages of wheels and treads.

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

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

5 Engineering Process
Students work on defining problems, researching, specifying requirements, brainstorming, development, prototyping, testing, and improving.

Course Schedule

Day 1

Class Welcome

Students are introduced to the class and rules and then form groups.

Lesson: Introduction to Engineering
Students become familiar with the engineering design process and how they will use this process to invent and improve their creations.

Challenge: Top Spinning
Students go through the steps of the engineering design process to create tops that spin for the longest amount of time.

Day 2

Challenge: Mini Golf
Students design motorized golf clubs to play a game of robotic golf.

Day 3

Build EducatorBot
Students build the EV3 EducatorBot to complete tasks using car controls.

Lesson: Introduction to Programming
Students learn the basics of programming with the EV3 software.

Activity: Movement Checklist
Students complete a checklist to confirm they understand how to program movement in EV3.

Day 4

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

Day 5

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

Day 6

Challenge: Touch Sensor Battle
Students use the touch sensor to activate a designed weapon when pressed.

Day 7

Build TrackBot
Students build Trackbot, the tank robot that utilizes treads.

Lesson: Gyro Sensor
Students learn about the nuances of programming with the gyroscopic sensor.

Day 8

Activity: Line Following

Students combine their knowledge of the switch block and the color sensor to create a program that allows for the Educator Bot to follow a complex line.

Day 9

Challenge: Sumo

Students customize the Trackbot and compete in a head to head competition.

Day 10

Class Wrap Up

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

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