

Fairfax Collegiate

2026 Summer Program

Competitive Robotics Course Syllabus

Rising Grades 7-9



Course Description

Enter daily robotic contests.

Build competition EV3 robots such as maze solvers, drag racers, trash bots, sumo wrestlers, RPS warriors, Kart racers, and footballers.

Learn about robotic design, EV3 programming, sensors, gear ratios, autonomous navigation, and robot I/O.

Students employ strategy, a competitive mindset, and experimenting with Legos. They take on programming challenges and refine robot performance through testing and iteration. With instructor-led challenges and team collaboration, students gain confidence as problem-solvers.

Students design, program, and modify EV3 robots to compete in races, mazes, soccer matches, and combat challenges. They use sensors, Bluetooth controls, and advanced logic to improve navigation and responsiveness. Competitive events encourage creativity, teamwork, and strategic thinking.

Students finish the course with stronger robotics skills and experience applying engineering concepts under pressure.

Learning Objectives

Course Goals	<p>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.</p> <p>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.</p> <p>Develop Competition Experience and Strategies: Students are challenged by the instructor and other students to refine their abilities in programming and robotic design.</p>
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Course Topics	<p>Problem Solving: Students improve their problem solving skills by assessing the challenge, brainstorming solutions, cooperative planning, trial and error, and delegating team member responsibilities.</p> <p>Sensors and Feedback: Students use tilt, color, ultrasonic, and touch sensors. They learn about sensor input, feedback, math, and sensor programming blocks.</p> <p>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.</p> <p>EV3 Programming: Students use the EV3 Programming language, custom programming blocks, control loops and datawires, Bluetooth messaging connections, programming sequences, and logic.</p> <p>Geometry and Navigation: Students improve their robots through measurement and course planning, angles and turn calculations, types of turns, obstacle avoidance, and line following.</p> <p>Competition Strategies: Students test and refine ideas through competition, challenges, and teamwork.</p>
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Course Schedule

Class Meeting 1	<p>Class Welcome: Students are introduced to each other and form the groups they'll be working in over the course of the class.</p> <p>Build Taskbot: Students begin to build the EV3 TaskBot once successfully grouped.</p> <p>Build Taskbot: Students begin to build the EV3 TaskBot once successfully grouped.</p> <p>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.</p> <p>Lesson: Programming Basics: Students learn the movement block options available in EV3, as well as the switch and loop blocks.</p>
Class Meeting 2	<p>Activity: Movement Checklist: Students go through the 8 different exercises in the workbook for movement.</p> <p>Activity: Turns Checklist: Students complete the checklists and get familiar with accurate turns.</p> <p>Lesson: Introduction to Sensors: Students learn about the different sensor control options available to them.</p> <p>Activity: Sensor Checklist: Students complete the sensor checklist and get familiar with different options available to them.</p>
Class	<p>Challenge: Two Button Remote Control: Students test their knowledge of the flow control options</p>

Meeting 3	<p>and create a two-button remote control for the TaskBot.</p> <p>Activity: Ultrasonic Maze: Students use the ultrasonic sensor to navigate through a maze.</p>
Class Meeting 4	<p>Lesson: Gear Ratios: Students learn about gear ratios and use this knowledge to modify their vehicles.</p> <p>Challenge: Drag Race: Students customize their robots and the gear ratios of their robots to compete in a drag race.</p> <p>Challenge: Trash Bot: Students push out trash or other items from an arena using a combination of the ultrasonic and color sensors.</p>
Class Meeting 5	<p>Challenge: Sumo: Students customize their robots for combat.</p> <p>Challenge: Sumo: Students customize their robots for combat.</p> <p>Lesson: Data Wires: Students learn the more complicated aspects of EV3 programming.</p>
Class Meeting 6	<p>Activity: Rock, Paper, Scissors: Students program a robot that can play Rock, Paper, Scissors using data wires.</p> <p>Lesson: Reaction Time Game: Students walk through data wires and variables to create a simple game using the EV3 brick.</p> <p>Lesson: Reaction Time Game: Students walk through data wires and variables to create a simple game using the EV3 brick.</p> <p>Lesson: Bluetooth: Students learn about Bluetooth controls and programming.</p>
Class Meeting 7	<p>Challenge: Mario Kart Racing: Students race each other through a course designed by their instructors using Bluetooth connections.</p> <p>Challenge: Mario Kart Racing: Students race each other through a course designed by their instructors using Bluetooth connections.</p>
Class Meeting 8	<p>Challenge: RoboCup Soccer: Students form teams and play soccer using their robots.</p> <p>Challenge: RoboCup Soccer: Students form teams and play soccer using their robots.</p>
Class Meeting 9	<p>Challenge: Battle Royale: Students customize a robot to fight in a challenge that they design.</p> <p>Challenge: Battle Royale: Students customize a robot to fight in a challenge that they design.</p>
Class Meeting 10	<p>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.</p> <p>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.</p>