Fairfax Collegiate
2026 Summer Program
Robotics Olympiad Course Syllabus
Rising Grades 4-6

Course Description

Build and program robot athletes.

Compete in daily robot athletic challenges. Build EV3 robots that drag race, solve mazes, wrestle, win at rock-paperscissors, and play soccer.

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

Students participate in robotics challenges and friendly competition. They improve their programming skills while testing their robots in exciting events. With steady coaching and team-based challenges, students gain confidence through practice and iteration.

Students program EV3 robots to complete tasks like line following, maze navigation, races, soccer matches, and combat-style challenges. They experiment with sensors, Bluetooth controls, and advanced logic to improve performance. Competition days encourage creative thinking, teamwork, and resilience.

Students finish the course with stronger technical skills and enthusiasm for robotics competitions.

Learning Objectives

Course Goals	**Understand Intermediate Programming Logic and EV3:** Students learn how to program mobile robots using the EV3 programming language and how to utilize sensor feedback systems for conditional logic. **Develop Engineering and Problem-Solving Skills:** Students apply measurement and geometry to optimize robot navigation and path planning and work in teams to develop creative solutions for challenges. They integrate what they learn about sensors, programming, and robot design to create complex robot behaviors. **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	**Robotics Design Principles:** Students understand gear ratios, stability and center of gravity, articulation and motorized limbs, and optimum sensor placement. **Sensors and Feedback:** Students learn about tilt, color, ultrasonic, and touch sensors. They use sensor input, feedback, math, and sensor programming blocks. **EV3 Programming:** Students learn the EV3 Programming language, custom programming blocks, control loops and datawires, Bluetooth messaging connections, programming sequences, and logic. **Problem Solving:** Students learn how to assess a challenge, brainstorm solutions, cooperatively plan, use trial and error, and delegate team member responsibilities. **Geometry and Navigation:** Students practice measurement and course planning, angles and turn calculation, types of turns, obstacle avoidance, and line following. **Competition Strategies:** Students test and refine ideas through competition, challenges, and teamwork.

Course Schedule

Class Meeting 1	**Class Welcome:** Students are introduced to each other and the class rules. They then form groups. **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 two of the block tabs in the EV3 programming language and what the block types are used for. **Activity: Movement Checklist:** Students go through various different exercises in the workbook for movement.
Class Meeting 2	**Activity: Turns Checklist:** Students complete a provided checklist 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 **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.

Class Meeting 3	**Activity: Line Following:** Students combine their knowledge of the switch block and the color sensor to create a program that allows for the Taskbot to follow a complex line. **Challenge: Two Button Remote Control:** Students test their knowledge of the flow control options and create a two-button remote control for the TaskBot.
Class Meeting 4	**Activity: Ultrasonic Maze:** Students use the ultrasonic sensor to navigate through a maze. **Challenge: Sumo:** Students use their knowledge of all the sensors and basic programming knowledge and participate in a simple robotic fight.
Class Meeting 5	**Challenge: Sumo:** Students use their knowledge of all the sensors and basic programming knowledge and participate in a simple robotic fight. **Lesson: Data Wires:** Students learn about the input and output block settings in the EV3 software.
Class Meeting 6	**Activity: Data Wire Checklist:** Students complete the data wire checklist and familiarize themselves with advanced programming techniques. **Challenge: Rock, Paper, Scissors:** Students program a robot that can play Rock, Paper, Scissors using data wires. **Lesson: Bluetooth:** Students learn about Bluetooth controls and programming.
Class Meeting 7	**Challenge: Mario Kart Racing:** Students race each other through a course designed by their instructors using Bluetooth connections. **Challenge: Mario Kart Racing:** Students race each other through a course designed by their instructors using Bluetooth connections.
Class Meeting 8	**Challenge: RoboCup Soccer:** Students form teams and play soccer using their robots. **Challenge: RoboCup Soccer:** Students form teams and play soccer using their robots.
Class Meeting 9	**Challenge: Bluetooth Sumo:** Students participate in a battle using customized robots. **Challenge: Bluetooth Sumo:** Students participate in a battle using customized robots.
Class Meeting 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. **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.