Title: VEX Robotics: Engineering the Future

Subtitle: A Comprehensive Guide to VEX IQ, V5, and Competitive Excellence

Organization: CodeCraft Education

Website: www.codecraftedu.com

Date: 2026 Edition

Introduction to VEX Robotics

The Vision

At CodeCraft, we believe robotics is the ultimate intersection of science, technology, engineering, and mathematics (STEM). This guide introduces students to the VEX ecosystem—the world's leader in educational robotics.

What is VEX?

VEX is a scalable robotics platform that grows with the student.

- **VEX IQ (Grades 4-8):** Snap-together plastic parts, ideal for learning mechanics and logic.
- **VEX V5 (Grades 9-12+):** Metal-based construction with high-speed motors and advanced sensors.
- **VEXcode:** The unified software platform for Block, Python, and C++ programming

Mechanical Foundations: The Build

To build a successful robot, one must understand the "physics of the machine."

1. Structure

- **Chassis:** The frame of the robot. Must be rigid and square.
- **Fasteners:** Using nuts, bolts, and standoffs to create multi-dimensional builds.

2. Motion & Power

- **Motors:** Converting electrical energy into rotational force (Torque).
- **Drivetrains:** 2-wheel, 4-wheel, or Mecanum drives for omnidirectional movement.
- **Gear Ratios:** * **High Speed:** Small gear driving a large gear.
    - **High Torque:** Large gear driving a small gear.

Electronics and Brains

The "Central Nervous System" of your VEX robot.

The V5 Brain

- **Processing:** ARM Cortex A9 processor.
- **Connectivity:** 21 Smart Ports for motors and sensors.
- **Display:** 4.25-inch color touch screen for real-time diagnostics.

Smart Motors

VEX Smart Motors are not just spinners; they are encoders. They track:

- Position (degrees or rotations)
- Velocity (RPM)
- Current (Amps) and Temperature

Sensors: Making the Robot "See"

Autonomous behavior requires input from the environment.

Sensor	Function	Common Use Case
Inertial Sensor	Tracks heading and rotation	Precise 90-degree turns.

Optical Sensor	Detects color and proximity	Sorting game objects by color.
Distance Sensor	Measures distance via laser	Stopping before hitting a wall.
Vision Sensor	Recognizes shapes/colors	Tracking a goal across the field.
Bumper Switch	Detects physical contact	Triggering a limit for an arm or lift.

Programming: From Blocks to Python

Coding is where the robot gets its personality.

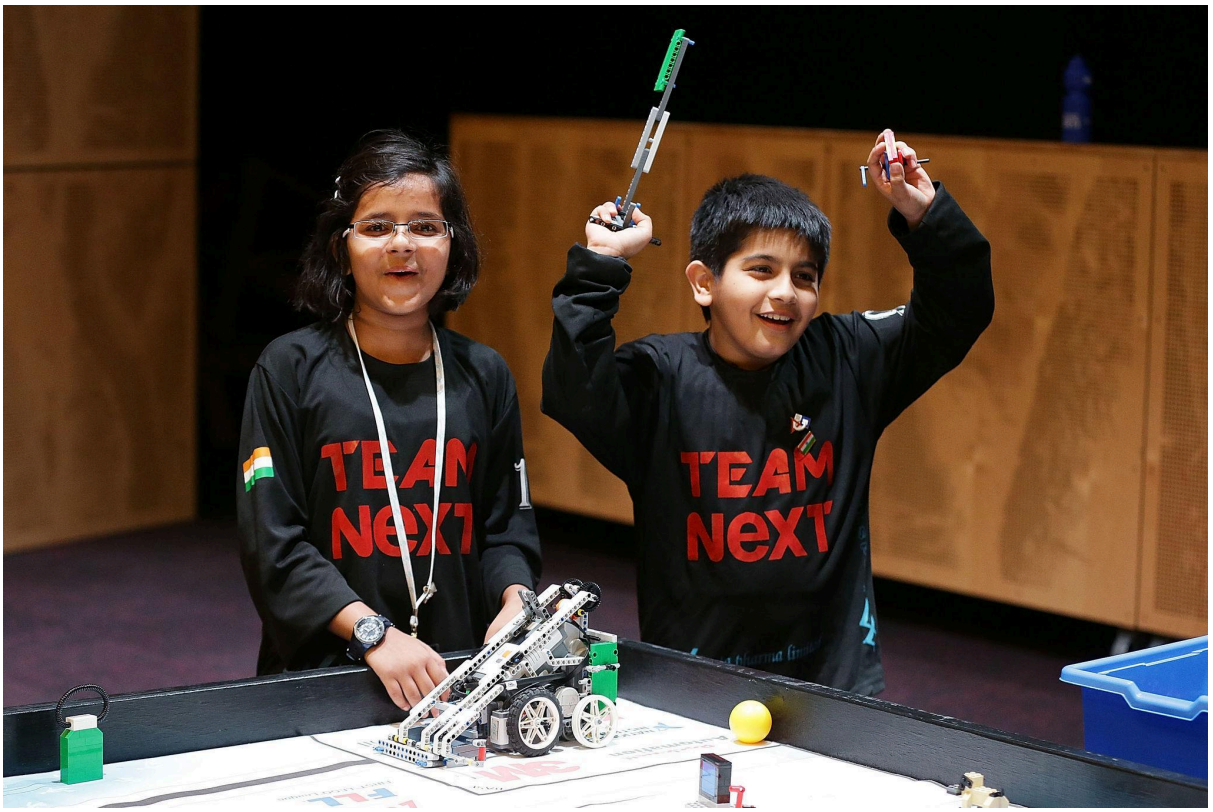
The Learning Path at CodeCraft

1. **Block-Based:** Drag-and-drop logic for beginners (Logic, Loops, and Variables).
2. **Switch Blocks:** A 2026 innovation that shows the Python equivalent next to the blocks.

3. **Pro Text (Python/C++):** Full control over multitasking and advanced algorithms like PID (Proportional Integral Derivative) control.

Sample Pseudo-code for Autonomous:

> "Drive forward 24 inches, spin intake motor, turn 90 degrees right, and launch projectile."



The Engineering Design Process (EDP)

Engineering is not a straight line; it is a circle.

1. **Define:** What is the goal? (e.g., "We need to lift a 2lb block").
2. **Research:** Look at existing "Hero Bots" and mechanical examples.
3. **Prototype:** Build a "Minimum Viable Product" (MVP).
4. **Test:** Break it. Find the weak points.
5. **Iterate:** Improve the design based on test data.

The Engineering Notebook

In VEX, the **Notebook** is as important as the robot.

Why Document?

- It is a requirement for the **Excellence Award** and **Design Award**.
- It proves the students did the work, not the mentors.

What to Include:

- Daily logs with dates and team member signatures.
- Sketches of designs and CAD (Computer-Aided Design) screenshots.
- Code snippets and explanations of why certain logic was chosen.
- Game strategies and "scouting" notes on other teams.

Competitive Excellence: The 2025-2026 Season

VEX competitions are the "Sport of the Mind."

The V5RC Game: "High Stakes"

- **The Field:** 12' x 12' foam mat area.
- **Alliance Play:** You play with a partner team against two opponents.
- **The Skills Challenge:** * **Driving Skills:** 60 seconds of human control.
    - **Programming Skills:** 60 seconds of pure AI control.

Strategy Corner

- **Efficiency:** How many points per second can your robot score?
- **Defense:** Can your robot withstand a push from a 20lb opponent?

Getting Involved with CodeCraft

Join the community at **www.codecraftedu.com**.

Our Programs

- **Introductory Workshops:** 4-week courses on VEX IQ basics.
- **Competitive Teams:** Full-season commitment for regional and world championships.
- **Advanced Coding:** Deep dives into Python for Robotics.

Contact Information

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"The best way to predict the future is to build it."