

# STEAMPI After-School Program Syllabus

## Program Description

This comprehensive program immerses students in the dynamic intersection of robotics, coding, art, and technology, specifically designed to cultivate logical thinking and creative problem-solving. Students will understand and apply basic coding principles to control the VEX GO Code Base Robot while grasping fundamental coding principles and sensor integration. In the scratch part, students will learn to design interactive art, dynamic visual effects using mouse and sound inputs, and mastering tools like the pen for geometric creations. The program culminates with "Creative Coding & Sensory Experiences" in Scratch, where students will enhance their coding prowess by developing generative art, musical interactions, projects using video sensing, and personalized digital creations like interactive cards. Throughout, the focus remains on empowering students to think critically, express creatively, and build a strong foundation in both physical and digital technological applications.

### *Phrase 1: Robotic & Mechanical Design*

Week	Area of Focus	Lesson Objective
1	Robot Structures & Drivetrains	Construction of stable robot designs and drivetrain systems while developing foundational engineering and building skills. Investigation of how design choices influence mobility, balance, and overall performance.
2	Mechanical Movement	Exploration of pivots, linkages, and moving mechanisms that convert and transfer motion to perform specific tasks. Analysis of how different mechanisms affect efficiency, range of movement, and functionality.
3	Simple Machines	Introduction to levers, wheels and axles, and how simple machines transfer force and make work easier in mechanical systems. Exploration of how these components can be combined to solve more complex engineering challenges.
4	Autonomous Movement	Basic programming concepts using VEXcode GO to control robot movement, navigation, and autonomous behaviours. Development of increasingly precise and efficient movement sequences to complete robotic tasks.

Week	Area of Focus	Lesson Objective
5	Gear Systems	Investigation of gears, gear ratios, rotational transfer, directional changes, and mechanical advantage in robotic designs. Application of gear systems to optimize speed, torque, and mechanical performance.

*\* Students with different levels will be given different challenges and objectives*

### **Phrase 2: Visualization & Digital Arts**

6	Digital Animation	Creation of animated digital scenes through sprite control, costume changes, and visual effects. Development of more dynamic animations using coordinated events and visualization techniques.
7	Loops & Repetition	Use of repeat structures and programming logic to automate actions, improve efficiency, and create dynamic behaviours. Exploration of nested loops and pattern-based programming to solve more complex tasks.
8	Sound & Video Integration	Develop interactive projects that incorporate sound and music in meaningful ways. Integrate and utilize video sensing to create engaging and reactive Scratch projects
9	Interactive Storytelling	Development of interactive stories using events, user input, animation, sound, and visual storytelling techniques. Creation of branching interactions and responsive elements that enhance audience engagement.

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### **Phrase 3: Computational Thinking & Logic**

10	Game Design Fundamentals	Design of engaging games through player controls, collision detection, objectives, scoring systems, and interactive mechanics. Refinement of gameplay through balanced challenges, feedback systems, and user experience design.
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11	Advanced Coding & Debugging	Application of variables, broadcasts, cloning, timers, and systematic debugging to create more sophisticated projects. Development of efficient coding strategies and structured problem-solving techniques for larger programs.
12	Advance Logic Development	Provide a deep understanding of logic statements and arithmetic math computations. Ability to apply logic into different projects.
13	Event Management In Coding	Application of managing different events on both sending and receiving events. Integrate logic codes with events to allow the communication between different sprites.
14	Project Showcase & Reflection	Presentation of completed projects, communication of design decisions, and reflection on learning, creativity, and technical growth. Evaluation of project outcomes and identification of opportunities for future improvement and innovation.

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