TOT Program

Course Syllabus

Course title: **Spike Prime & EV3 Robotics - Advanced**

Prerequisites: **Basics Robotics Programming & Design**

Credit hours: **18**

Target audience: **Trainers and Teachers**

Course Description:

This professional Training of Trainers (TOT) course is purposefully designed for educators and coaches aiming to lead, mentor, and prepare teams for elite global competitions such as FLL and WRO, or to deliver high-tier robotics programs mapped to the global STEM framework. This high-impact, hands-on program equips trainees with advanced mechanical design principles and sophisticated coding architectures. On the engineering front, it covers complex gear systems and power transmission, structural robot cores, dynamic attachments, and robust lifting mechanisms. Structurally integrated into the programming track is the mastery of high-level coding concepts, including variables, arrays, acceleration algorithms, P and PD controllers. Every theoretical and technical milestone is thoroughly wrapped in real-world implementations, ensuring trainers emerge with complete operational readiness for high-stakes competitive environments.

The Content	Duration (hour)
Design Approach **Subject 1: Robot design III** • Interior and exterior structures • Arms and lifts • Weight distribution and similarity • Wheel-effect • Implementations **Subject 2: Gearing Systems - Advanced** • Mechanisms and principles • Types and uses • Gear ratio • Implementations **Subject 3: Motion Transmission - Advanced** • Mechanisms and principles • Implementations **Subject 4: Arm Design - Advanced** • Mechanisms and principles • Implementations **Subject 5 : Main Robot for FLL** • Explaining the mechanism of designing a robot for the FLL competition, with practical examples and designs specific to the competition using the SPIKE PRIME kit. **Subject 6: Design robot arms to solve the challenge** • Design robot extensions, how to attach arms to extensions . • Learn how to design and build practical applications used in solving FLL missions.	9

Programming Approach	9
Subject 1: Utilizing Variables • The principle of variables in coding • Blocks in use • Implementations **Subject 2: Motor rotation sensor** • The programming concept • Blocks in use • Implementations **Subject 3: Arrays** • The programming concept • Blocks in use • Storing and fetching data • Employing mathematical Probability **Subject 4: Introduction to Control Engineering** • Traditional control • P and D controllers • Line follower • Moving in straight perfectly • Accurate rotating (pivot & spin) • Acceleration & deceleration **Subject 5: Advanced Applications** • Line follower • Moving in straight perfectly • Accurate rotating (pivot & spin) • Acceleration & deceleration **Subject 6: Problem-Diagnosis Procedure**	

Course Requirements:

1. Laptop
2. Spike prime & EV3 robotics core and extension kits