



# High School Program Start-up Guide

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## Introduction

The mission of the evGrandPrix High School Program is to inspire High School students to engage in STEM education and motivate them to pursue advanced STEM education by providing an exciting platform in which the students experience STEM principles first-hand. This integrated STEM program is learning by doing within a Motorsports environment. Using electrically powered go-karts as the focus, the program inspires students to commit their creative energies to learning about, developing, and showcasing the future of electric vehicle technologies.

The evGrandPrix Program runs annually coinciding with the academic year and includes events in both the Fall and Spring. In the Fall, several "Test & Tune" events are held at various locations in Indiana. These events allow new students the opportunity to learn about their go-kart and explore the factors that improve its performance. The Fall season concludes with the "Fall Classic" race at the Purdue Grand Prix Track. The race creates an exciting environment for students to assess their kart's performance in competitive head-to-head racing.

During the Spring, additional "Test & Tune" events are held, and the year culminates with the evGrandPrix Season Championship. The Season Championship consists of a multi-faceted competition that includes a Design Report, an Outreach video, and a race at the Purdue Grand Prix track. The points from these three events are totaled to determine the overall evGrandPrix High School Season Champion.

Safety is the top priority, and the goal is to maintain a safe environment that enables a fun and rewarding educational experience for all participants. Safety is a primary factor for the kart design, the rules, and all events.

This start-up guide will explain the resources available with the goal of providing teachers and administrators all the key information to launch a successful program and create incredible learning experiences for their students.

Thank you for your interest in the evGrandPrix and I look forward to seeing your school at the track!

Sincerely,

Todd Nelson

Managing Director, Purdue Motorsports
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## 1. Why should your school start an evGrandPrix program?

The evGrandPrix High School Program provides an exceptional STEM learning experience at an affordable price. The Motorsports platform creates an exciting experience that attracts students to engage in STEM activities. Through their participation in the evGrandPrix Program, many students will realize for the first time that they have an interest in a STEM career and they develop the confidence to pursue a that career.

Purdue Engineering and Polytechnic have partnered to combine world-class experience in engineering and technology education to create a program that creates a wide array of opportunities for students to develop the various skillsets required to be successful in a STEM career, or any career. Under the guidance of a High School teacher and support from Purdue, students not only improve their ability to apply STEM principles, but they also gain valuable experience working in a team, serving as a leader, engaging with a variety of stakeholders, marketing their team, and managing a project.

The evGrandPrix High School Program is a great way to inspire your students to engage in STEM activities and develop essential career skills. The remainder of this document will tell you more about the Program and how to get started.

## 2. Finances

We work to keep the cost of the evGrandPrix program as low as possible while creating exceptional learning experiences. Below is summary of typical costs to start-up and operate an evGrandPrix Program at your school. Many schools decide to have 2 or 3 karts to maximize utilization of the support resources and increase the number of students that can participate.

## A. Start-up Cost

### Kart Equipment (for each kart)

| | |
|---|---|
| • EVGP Chassis | $3,200 |
| • EV Motor & Drivetrain kit | $2,400 |
| • Battery Pack | $380 |
| • Tires | $230 |
| • Sprockets, Chain, Keyway | $120 |
| • Kart Stand (including shipping) | $450 |
| • Driver Equipment | $600 |
| • Battery Charger | $350 |
| • Aim SOLO 2 Dash (not required, but recommended) | $460 |
| **Per Kart Sub-total** | **$8,190** |

### Tools and Support Equipment (shared across multiple karts)

| | |
|---|---|
| • Sniper Camber Gauge | $320 |
| • Chain Breaker & Chain Aligner Tools | $125 |
| • Brake Bleeder Kit | $95 |
| • Tire Mount/Dismount & Bead Break Tools | $260 |
| **Tools and Support Equipment Sub-Total** | **$800** |
| **TOTAL COST FOR FIRST KART** | **$8,990** |

## B. Annual Operating Cost (estimate only, varies by school and participation)

### Kart Maintenance (per kart)

| | |
|---|---|
| • New Battery Pack | $380 |
| • New Tires | $230 |
| • New Sprocket, Chain, Keyway | $120 |
| **Estimated Annual Kart Maintenance Cost** | **$730** |

## Program Participation Costs (per kart, assuming 10 students for each kart)

| | |
|---|---|
| • Fall Test & Tunes registration | $0 (or minimal) |
| • Fall Race registration | $100 |
| • Fall Race pit passes | $100 |
| • Spring Test & Tunes registration | $0 (or minimal) |
| • Spring Championship registration | $350 |
| • Spring Championship pit passes | $100 |
| **Estimated Annual Program Cost per Kart** | **$650** |

## C. Other Potential Costs / Resource needs (vary by school)

- Workspace to assemble and maintain kart(s)
- Hand tools to assemble and maintain karts(s)
- Tool boxes
- Fire extinguisher (rules require 1 per kart)
- Tire air pump
- Tire gage
- Stop watches
- Laptop(s) for motor controller software and track data analysis (SOLO 2)
- Trailer to take kart(s) to events
- Vehicle to tow the trailer

## D. Suggested ways to provide revenue for your Program

- State funding: Apply for funding through State Grants
- Local funding:
    - Apply for funding/grants from school district
    - Request funds or gift-in-kind from businesses and members in your community
- evGrandPrix: From time-to-time the evGrandPrix program has partnerships with companies that are interested in directly funding High Schools. Contact Corey Sharp (sharp22@purdue.edu) to learn more.

## 3. Getting Started

You've made it past the finances, and you are ready to start an evGrandPrix team! Below are some tips to get started.

### A. Organizing your team

The first step is to decide if you will operate your evGrandPrix program and an extra-curricular club or integrate it into a class. The choice is yours depending on your school's situation. What you choose does not impact your participation in the evGrandPrix program, so pick whatever works best for you. In tandem with this choice, if you haven't already, you need to choose a teacher or staff member to mentor the students.

With a mentor in place, the format of your program decided, and the number of karts determined, you can recruit students for your evGrandPrix Program! Each school will do this in a way that best suites them. Keep in mind that you need a minimum of 3 students per kart (team) to participate in evGrandPrix events. There is no limit on the maximum number of students per kart, but feedback from current participants suggests that more than 10 students per kart increases the difficulty of providing a meaningful learning experience for all students.

### B. Buying a kart kit & supplies

The evGrandPrix High School Program uses a spec kit kart provided by Top Kart USA. When you are ready to order, contact Blake Deister at Top Kart directly (sales@topkartusa.net; 317-870-3122). Further details about the kit can be found on the Top Kart's website (http://topkartusa.net/electric/). All estimated costs are included in the Finance section above and Top Kart will provide you a full quote before you order.

### C. Assembling your kart

There are several resources available to help the students successfully assemble their kart.

i. Assembly manual
ii. Assembly How-to video tutorials
iii. Wiring Diagram
iv. Technical Support
    - Top Kart USA: Blake Deister (sales@topkartusa.net; 317-870-3122)
    - Purdue evGrandPrix Education Coordinators: Randy Glaze (rjglaze@purdue.edu)

Once the students have their kart assembled, it is highly recommended that they perform a full Technical Inspection to ensure the kart and team meets all the requirements necessary to operate the kart and participate in evGrandPrix events safely and appropriately. The Technical Inspection form is found on the evGrandPrix website: https://engineering.purdue.edu/evGrandPrix/highschoolresources/

## 4. Learning and Experience

A. **Kart set-up** (How-to video tutorials coming soon)

i. Setting up and adjusting the kart's front-end

ii. Understanding the motor controller and adjusting the settings

iii. Determining gear ratio

**B. Data Acquisition**

i. Solo 2: Setting up, capturing data, and using the data to improve kart and driver performance.

ii. Physics Box: Setting up, capturing data, and using the data to improve kart and driver performance.

iii. Data sheet: There are many factors that combine to produce the overall performance of the kart. Students must determine the combination that produces the optimal kart performance. Because the number of factors and combinations is so large, it is important to document every set-up and change to enable patterns to be detected so the team can efficiently and effectively improve kart performance in a logical and rationale way. A Kart Data Sheet is provided on the evGrandPrix website for this purpose. (set-up, lap times, lap count, tire temps, etc)

**C. Practice and Test & Tunes**

Prior to each kart driving session, it is strongly recommended that the students perform a full Technical Inspection and the teacher review and confirm compliance. To get the most out of the driving session, a pre-determined test plan is suggested. The test plan should propose which factors will be adjusted for each test and how they will be adjusted. The Kart Data Sheet can be used to document the original set-up, each subsequent set-up, and associated test results. After each test, students should analyze and interpret the results to determine whether to continue with the original test plan or modify it to improve their understanding of kart performance variables.

**D. evGrandPrix Races**

See the evGrandPrix High School rules for details on qualifying and race procedures. Contact the Director of Event Operations with any questions.

## 5. Communications

The primary forms of communication that will be used by evGrandPrix administrators are: email, the EKS Forum, and the evGrandPrix website (https://engineering.purdue.edu/evGrandPrix/).

## 6. Other Resources

A. **Program contacts**

**Todd Nelson**
Director of Event Operations
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**Corey Sharp**
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**Blake Deister**
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**B. evGrandPrix High School Website** (https://engineering.purdue.edu/evGrandPrix/highschool/)

i. Rulebook
ii. Events schedule
iii. Design Report Rubric
iv. Outreach Video Rubric
v. Additional resources
vi. Past results
vii. Frequently used Datasheets & Parts