EV Challenge
Rules and Specifications
2020

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Updated November 1, 2019

Introduction

The EV Challenge is the educational program of the nonprofit Carolina Electric Vehicle Coalition (CEVC). The mission of the EV Challenge is to energize high school students about engineering through a real world electric vehicle program. It is a year long educational program and competition and is more than a single event. Ideally schools or student groups would form an electric vehicle club and integrate the program into their educational curriculum. The program is designed to be interdisciplinary and involves students from a variety of backgrounds and interests. It encourages innovation and problem solving. The EV Challenge also provides opportunities for students to educate the public about the benefits of electric vehicles. But the **overriding goal of the program is safety of the participants**.

The final interpretation of these rules and specifications will be determined by the EV Challenge staff and CEVC board.

Insurance

All school participants are required to complete and sign any insurance waivers provided as part of the registration materials for each event. Typically, this includes "Parental Consent" and "Minor's Assumption of Risk" forms for minors and general liability waivers for adults. These forms will be sent to all teams prior to the final event.

Team Participation

A single school may enter up to two teams in the EV Challenge. However, each team must have their own vehicle and representatives for non-vehicle events (e.g., the same student cannot represent two teams in troubleshooting or give the presentation). Teams from a single school must use the same score for Outreach. Student groups such as home schools or a non-school associated club may also participate as a team.

Competition

Team scores are based on several categories. Brief descriptions and category weights are shown below.

Category	Weight (% of total)	Description	
Theme and Billboard	10	Scoring is based upon how well the team integrates their chosen theme into all the other categories.	Non-Vehicle
Outreach	10	Encourages teams to participate in public education events throughout the year.	
Quiz Bowl	10	Teams of 4 respond to live questions about air quality, EV technology, and other topics.	
Presentation	10	A speech, skit, or video that explains the theme and summarizes the team experience.	
Troubleshooting	10	Teams of 2 complete a timed, written test and use electrical skills on a standardized vehicle simulator.	
Vehicle Design	10	Judges assess workmanship and how well teams followed the design guidelines.	Vehicle
Autocross	20	Timed performance through a slalom course at the Final Event.	
Acceleration	10	Timed performance over fixed, straight line distance.	
Range	10	Total distance compared to other teams on oval track.	

Theme and Billboard

Each team will select a theme. The goal is to integrate the selected theme across all areas of the competition. It can include the vehicle design, how the vehicle is decorated, the nature and content of the presentation, how the team is dressed the day of the Final Event, the methods the team uses for outreach activities, etc. For example, if a team selected the Scooby Doo Mystery Machine as their theme, then the vehicle would be decorated to match, team shirts might show characters from the cartoon or they could dress in 70s vintage clothes, and the presentation might be a skit where the team solved a mysterious air pollution problem.

Each team will create a billboard design to fit within the standard billboard dimensions of 14 feet tall by 48 feet wide. The goal of the billboard is to convince viewers to drive electric vehicles. Teams should bring a printed version of their billboard for display that is 14 inches by 48 inches. The billboard should align with the theme.

Outreach

Teams earn outreach points through various activities throughout the year. All activities must be recorded on the Team Outreach Form with appropriate supporting documentation. This form must be brought to the Final Event and submitted as part of the Team registration process. All teams that earn over 150 points for outreach are awarded first place for this category. Note that total outreach points are used as the first determinant for a tie. See Scoring. The Team Outreach Form is in an appendix.

Quiz Bowl

The quiz bowl is designed to test students' general knowledge about electric vehicles, air pollution, climate change, and energy policy. Each team may have up to 4 students on their quiz bowl team. In the past, the quiz bowl was administered through the Kahoot mobile app.

Presentation

The goal of the presentation is to convince viewers to drive electric vehicles. In addition, each team should creatively share their theme and summarize the team experience. The format of the presentation may be a solo speech, a powerpoint presentation, a group skit, video, etc. The presentation should be no longer than 7 minutes. A panel of judges will evaluate the presentation for general quality, how well it integrates the theme, and timeliness. Judges may ask the presenters a few clarifying questions after the presentation.

Troubleshooting

Each team shall designate two students to participate in the troubleshooting written test and to identify faults on the troubleshooting board.

Part 1 of troubleshooting is the written test. The written test will have 20 multiple choice questions, one short answer question, and will only last seven minutes. The test is designed to evaluate students' general knowledge of electric vehicle components and troubleshooting skills. No notes, scratch paper, or other aids will be allowed during the test. The two designated students per team will complete a single test together. Sample questions are in an appendix.

Part 2 of troubleshooting is to identify and correct faults on the troubleshooting board. The goal is to identify and correct two faults in the shortest amount of time. The maximum time limit is 7 minutes. Students will be able to use a multimeter (not provided), the board wiring diagram (provided), and pencil and paper if needed. The board wiring diagram is in the appendix to these rules. Faults may be corrected by using jumper wires or by replacing faulty components. Replacement components and wiring for the board will be provided as needed. No tools will be required. Teams are encouraged to provide their own safety glasses for this event.

Scoring for this event is based on 50 points for the written assessment and 50 points for the troubleshooting board. Teams earn up to 40 points for the multiple choice questions and 10 points for the short answer. Teams earn 25 points for correcting each fault on the board. Tie scores will be resolved in the following order:
1. Shortest time to correct both faults on the troubleshooting board.
2. Highest score on the multiple choice section of the written test..
3. Highest score on the short answer section of the written test.

Vehicle Design

Vehicle design will be judged according to the specifications and score sheet in the appendix. Multiple judges will review each vehicle and each judge will view every vehicle. Scores from the judges will be averaged to produce a single score for each vehicle. A student must be with the vehicle during design judging to answer questions. Note that much of the scoring is dependent upon the answers to these verbal questions.

Autocross

Teams will drive their vehicle through an autocross course multiple times. Each run will be timed. The course will be clearly marked with cones, barriers, and other methods. A 2 second penalty will be added for each cone knocked over or knocked outside the course boundary by the vehicle during a run. A cone penalty will not be assessed if the cone is bumped and remains standing. Event officials and student drivers will walk through the course prior to starting any runs. Any student who plans to drive the vehicle must participate in the course walk through. A vehicle that starts a run but is unable to complete it will be given a DNF for that run. In the event of a timer malfunction or other course disturbance, the team will be allowed to repeat that run. Teams will run in the order designated by event officials.

Acceleration

Teams will drive their vehicle over a straight distance for time. Distance is usually less than 100 yards. Each vehicle will have several runs with their best time recorded for the event.

Range

Teams will drive their vehicle around a standard track as many times as they can in 20 minutes. Slower vehicles may be passed in single file on the right hand side by faster vehicles only in straight sections of the track. Drivers may communicate with their team using hands free communication devices (e.g., radios, cell phones). Range will be the last vehicle event and teams may swap battery packs or charge their batteries prior to the range event.

Scoring

EV Challenge scoring is based upon place within a category and the weight of that category. A team's total points is the sum of their points for all the categories. Points are awarded based on the following table.

Place	Theme	Outreach	Quiz Bowl	Presentation	Troubleshooting	Design	Autocross	Acceleration	Range
1	10	10	10	10	10	10	20	10	10
2	9	9	9	9	9	9	18	9	9
3	8	8	8	8	8	8	16	8	8
4	7	7	7	7	7	7	14	7	7
5	6	6	6	6	6	6	12	6	6
6	5	5	5	5	5	5	10	5	5
7	4	4	4	4	4	4	8	4	4
8	3	3	3	3	3	3	6	3	3
9	2	2	2	2	2	2	4	2	2
10	1	1	1	1	1	1	2	1	1
11+	0	0	0	0	0	0	0	0	0

If there is a tie in overall scoring at the end of the event, the first tie-breaker will be a team's total points in the outreach category. The second tie-breaker with be the team's total score in Quiz Bowl.

Appendices

Safety Checklist
STEM Cycle Specifications
Design Scoresheet
Outreach Form
Sample Troubleshooting Test Questions