

A ADMINISTRATIVE REGULATIONS

A 1 COMPETITION OVERVIEW

A 1.1 Competition Objective

A 1.1.1 The competition challenges teams of university students to conceive, design, fabricate, develop and compete with small, formula style, race cars.

A 1.2 Competition Procedure

A 1.2.1 The competition is split into the following classes:

- Internal Combustion Engine Vehicle (CV) including Combustion Hybrid Vehicle (HY)
- Electric Vehicle (EV)

A 1.2.2 All vehicles must meet the requirements defined in chapters T and either EV or CV, depending on their drivetrain type.

A 1.2.3 The competition starts with a series of technical inspections described in chapter IN to check the vehicle for safety and compliance with the rules.

A 1.2.4 The competition is divided into a series of static and dynamic events described in chapters S and D.

A 1.2.5 The achievable points in each class are listed in table 3.

A 1.2.6 Vehicles of both classes can take part in an additional Driverless Cup (DC).

A 1.2.7 The maximum achievable points for the DC are listed in table 3.

A 1.2.8 The team with the most overall points will win the competition for its class or the DC, respectively.

A 1.3 Competition Information

A 1.3.1 The competition specific rules and information are defined in the competition handbook.

A 1.3.2 The official language of the competition is English.

A 1.3.3 Every organizer of a competition based on this document bears the sole responsibility.

A2 Vehicle Eligibility

	CV & EV	DC
Static Events:		
Business Plan Presentation	75 points	-
Cost and Manufacturing	100 points	-
Engineering Design	150 points	150 points
Dynamic Events:		
Skidpad	50 points	-
Driverless (DV) Skidpad	75 points	75 points
Acceleration	50 points	-
Driverless (DV) Acceleration	75 points	75 points
Autocross	100 points	-
Driverless (DV) Autocross	-	100 points
Endurance	250 points	-
Efficiency	75 points	-
Trackdrive	-	200 points
Overall	1000 points	600 points

Table 3: Maximum points awarded

A2 VEHICLE ELIGIBILITY

A2.1 Student Competition

- A2.1.1 Vehicles entered into the competition must be conceived, designed and maintained by the student team members without direct involvement from external professional engineers, racers, machinists or related professionals.
- A2.1.2 The student team may use any information from professionals or from academics as long as the information is given as a discussion of alternatives with their pros and cons.
- A2.1.3 Professionals must not make design decisions or drawings.
- A2.1.4 Students should perform fabrication tasks where ever possible.

A2.2 First Year Vehicles

- A2.2.1 A vehicle may only be used for one year, counting from the first day onsite of its first competition.
- A2.2.2 To be classified as new, a vehicle must have a newly manufactured chassis.
- A2.2.3 In the following cases, the existing chassis may be used for one more consecutive year:
- Changing the powertrain from CV → EV or CV → HY or HY → EV
 - Initial implementation of an Autonomous System, see T 14

The team must inform the officials ahead of time if they intend to use this exception.

A 3 RULES OF CONDUCT

A3.1 General Officials Authority

- A 3.1.1 The officials reserve the right to revise the schedule of the competition and/or interpret or modify the competition rules at any time and in any manner that is, in their sole judgment, required for safe and efficient operation.
- A 3.1.2 All team members are required to cooperate with, and follow all instructions from the officials.
- A 3.1.3 Official announcements are considered part of these rules.
- A 3.1.4 All guidelines and clarifications posted in the “Rules and Important Documents” sections on the competition website for the current season including the competition handbook are considered part of these rules.

A3.2 Official Instructions

- A 3.2.1 Failure of a team member to follow an instruction or command directed specifically to that team or team member results in 25 penalty points being deducted from the team’s overall score.

A3.3 Arguments with Officials

- A 3.3.1 Argument with, or disobedience to, any official results in the team being eliminated from the competition.

A3.4 Unsportsmanlike Conduct

- A 3.4.1 In the event of unsportsmanlike conduct, 25 penalty points will be deducted from the team’s overall score. A second violation results in expulsion of the team from the competition.

A3.5 Violations of Intent

- A 3.5.1 Violation of the intent of a rule will be considered a violation of the rule itself.
- A 3.5.2 Any parts, devices or software fragments designed with the intent to violate a rule, will be considered as a violation.

A3.6 Questions about the Rules

- A 3.6.1 Questions about the rules may be asked to the officials.
- A 3.6.2 The frequently asked questions (FAQ) section on the competition website must be checked before submitting a question.
- A 3.6.3 The officials will only answer questions that are not already answered in the rules or FAQs or that require new or novel interpretation.

A4 General Requirements for Teams & Participants

A 3.6.4 Refer to the competition website for specific directions how to submit a rules question.

A 3.7 Protests

A 3.7.1 A team may protest any rule interpretation, score or official action which they feel has caused some actual, non-trivial, harm to their team, or has had a substantive effect on their score.

A 3.7.2 All protests must be submitted in writing as defined in the competition handbook by the team captain within the announced protest period. In order to have a protest considered, a team must post a 25 point protest bond which will be forfeited if their protest is rejected.

A 3.7.3 The decision of the officials regarding any protest will be in a written form and is final.

A 3.8 Penalties

A 3.8.1 Rule violations result in at least 20 penalty points, unless explicitly defined otherwise. The penalty points will be deducted from the team's overall score.

A 3.8.2 Overall penalties apply to CV, EV and DC score, except for penalties concerning events which are not part of the respective class or cup.

A 4 GENERAL REQUIREMENTS FOR TEAMS & PARTICIPANTS

A 4.1 Teams per University

A 4.1.1 A university can register one CV team and one EV team which both can take part in the DC.

A 4.1.2 For the purposes of registering and competing, a university's CV team and EV team are considered to be separate and independent entities.

A 4.1.3 Teams which are formed with members from two or more universities are treated as a single team.

A 4.2 Team Members and Participants

A 4.2.1 Each participant must provide proof of valid private liability & individual health insurance for the competition.

A 4.2.2 All onsite participants must sign a liability waiver upon registering onsite which can be found on the competition website.

A 4.2.3 A team member may only be part of one team, work on one vehicle and take part in static and dynamic events for only one team.

A 4.2.4 Each team must have one team member identified as the team captain. The team captain is the main contact person for the officials during the registration process and the competition.

A 4.2.5 Persons who have previously attended any official event as a judge are not allowed to participate as team members.

A4 General Requirements for Teams & Participants

- A 4.2.6 Team members must be enrolled as degree seeking undergraduate or graduate students in any university. Team members who have graduated within the seven month period before the competition remain eligible to participate.
- A 4.2.7 Students seeking a PhD degree/PhD students or equivalent are not allowed to participate.
- A 4.2.8 Counting from the year of their first competition, team members can only participate for four additional full years. First competition is defined as the first registration of a team member for a competition by the team captain, irrespective if the team or the team member actually physically participated.
- A 4.2.9 Team members must be at least 18 years of age.
- A 4.2.10 Team members who will drive a competition vehicle at any time during a competition must present a valid, government issued driver's license for passenger cars, containing a photograph.

A 4.3 [EV ONLY] Electrical System Officer

- A 4.3.1 Every participating team has to appoint one to four ESOs for the competition.
- A 4.3.2 The ESOs are responsible for all electrical work carried out on the vehicle during the competition.
- A 4.3.3 The ESOs are the only persons in the team who may declare the vehicle electrically safe, in order for work to be performed on any system of the vehicle by the team.
- A 4.3.4 The ESOs must be valid team members, i.e. they must have student status, see A 4.2.6.
- A 4.3.5 The ESOs must be contactable by phone at all times during the competition.
- A 4.3.6 An ESO must accompany the vehicle whenever it is operated or moved around at the competition site.
- A 4.3.7 If only one ESO is named by the team, this ESO must not be a driver.
- A 4.3.8 An appropriate Electrical System Officer Qualification (ESOQ) requires the proof of a practical and theoretical training for working on the TS. Regarding content, the training should be on the basis of DGUV 209-093 stage 2E/3E¹ and held by an external expert.

A 4.4 Autonomous System Responsible

- A 4.4.1 To operate the Autonomous System (AS), the participating team must appoint at least one ASR for the competition. This person is responsible for all autonomous operations of the vehicle during the competition which includes any work on the AS as well as racing and testing.
- A 4.4.2 For vehicles with an electric drivetrain the ASR must fulfill A 4.3 and therefore replaces the ESO. The team may register additional ESOs for accumulator inspection and work on Tractive System (TS) only. The sum of registered ASRs and ESOs must not exceed four persons.

¹<https://fsg.one/4i5SP>

A5 Documentation & Deadlines

- A 4.4.3 The ASR is the only person in the team who is allowed to declare the AS safe, so that the vehicle may be operated in manual or autonomous mode.
- A 4.4.4 The ASR must be a valid team member, i.e. they must have student status, see A 4.2.6.
- A 4.4.5 The ASR must accompany the vehicle whenever it is operated or moved around at the competition site.
- A 4.4.6 If only one ASR is named by the team, this ASR must not be a driver.
- A 4.4.7 The ASR must be properly qualified to handle the AS and to understand and deal with problems and failures. As ASR Qualification (ASRQ), a bachelor degree in computer science, electrical engineering, mechatronics, automation engineering, robotics or similar, i.e. comparable study content or progress, is a sufficient qualification. The qualification certificate needs to be an official university document and contain information on completed courses.

A 5 DOCUMENTATION & DEADLINES

A 5.1 Required Documents and Forms

- A 5.1.1 Several documents and forms must be submitted by the action deadlines defined in the competition handbook.

A 5.2 Submission

- A 5.2.1 Submitted documents may only be viewed by members of the submitting team, authorized judges and officials.
- A 5.2.2 By submitting documents via the competition website, the team agrees that they may be reproduced and distributed by the officials, in both complete and edited versions, for educational purpose.
- A 5.2.3 Documents or videos that are largely incomplete or not readable/viewable will be considered as not submitted.

A 5.3 Correction Requests

- A 5.3.1 If the officials request a correction for a document, the corrected version has to be submitted within 168 hours (7 days) following the request.
- A 5.3.2 Corrections requested before the initial deadline are treated as if they were requested at the initial deadline.
- A 5.3.3 Separate requests for different parts within one document or form will be treated independently.
- A 5.3.4 If the corrected version of the document does not completely contain all requested corrections, the team will be de-registered from the competition.

A5 Documentation & Deadlines

A 5.4 Late Submission or Non-Submission

- A 5.4.1 For each submission later than the respective deadline 10 penalty points are deducted from the team's overall score.
- A 5.4.2 Teams that do not submit documents until 24 hours (1 day) after the respective deadline will be de-registered from the competition.

A 5.5 De-registration

- A 5.5.1 A team which is de-registered from the competition has a single chance to apply for a place on the waiting list.
- A 5.5.2 To apply, the team must complete the following within 24 hours after the de-registration notification
- Submit an informal application to the officials
 - Correct the reason for de-registration (e.g. submission of a document)
- A 5.5.3 If the application is positively confirmed by the officials, the team will:
- Be placed at the end of the waiting list.
 - Receive 20 penalty points.
- A 5.5.4 Applications will be declined if the rework is inadequate or de-registration was caused by misbehavior of the team.

A 5.6 Vehicle Status Video

- A 5.6.1 All teams must submit a video showing the vehicle driving in manual mode before the competition. The video must be submitted before the deadline specified in the competition handbook.
- A 5.6.2 [DC ONLY] The vehicle must instead drive in autonomous mode. No manual mode VSV is necessary.
- A 5.6.3 The video must show the following sequences in the described order:
- Standing still
 - 360° video around the vehicle (close up, may overlap with the following two bullet points)
 - [CV ONLY] Start engine / [EV ONLY] Activate TS
 - Straight driving, minimum distance is 30 m, minimum speed is 10 km/h for manual mode
 - Full stop (not needed for autonomous mode VSV)
 - 180° cornering
 - Straight driving back to start point, minimum speed is 10 km/h for manual mode
 - [DC ONLY] At the end of the VSV, the vehicle must be stopped by an emergency brake maneuver, see T 15.

A5 Documentation & Deadlines

- Standing still, [CV ONLY] engine off / [EV ONLY] TS deactivated

A 5.6.4 The video must fulfill the following criteria:

- Continuous video from a third person view - no assembled sequences
- Vehicle must be clearly visible (light, video resolution, landscape mode, frames and frequency)
- Vehicle must run under its own power
- Driving must follow A 6.3.4
- Vehicle must be presented in ready-to-race conditions incl. body work
- No crossing in front of the vehicle after [EV ONLY] TS activated / [CV ONLY] engine started
- [EV ONLY] Tractive System Active Light (TSAL), [DC ONLY] Autonomous System Status Indicator (ASSI), and brake light, must be clearly visible in the video
- [EV ONLY] Ready-to-drive (R2D) sound must be audible in the video
- [DC ONLY] In addition to the third person view, an onboard view and a visualization of the vehicle's environment perception and path planning must be shown in split screen. All parts must be time synchronized.
- Must not exceed a length of 60 seconds.

A 5.6.5 If a team fails only the [DC ONLY] part, it will only be de-registered from the DC.

A 5.6.6 A team which uploads a VSV with a previous year vehicle will be de-registered from the competition.

A 5.7 SES Approval

A 5.7.1 Teams using a monocoque must submit a SESA as one document, in addition to the SES deadline. The SESA template will be available on the competition website.

A 5.7.2 The Structural Equivalency Spreadsheet (SES) must be checked and approved by a graduated engineer with appropriate expertise.

A 5.7.3 Once the SES has been approved, the SESA form should be filled out, signed and submitted until the SESA deadline.

A 5.7.4 If any changes to the original SES become necessary due to the approval process, the updated final SES must be submitted again on the competition website.

A 5.7.5 The changelog with details of all changes made from the "Version History" tab of the SES form must be attached to the SESA document and must also be signed by the SES reviewer.

A 5.7.6 The officials will randomly double check submitted SESA with their respective submitted SES.

A 6 GENERAL RULES

A 6.1 Removing the Vehicle from the Site

- A 6.1.1 Teams who remove their vehicle ([EV ONLY] or TS accumulator) from the competition site after the competition has begun will be disqualified from the competition.

A 6.2 Forfeit for Non-Appearance

- A 6.2.1 It is the responsibility of each team to be in the right place at the right time.
- A 6.2.2 If a team is not present and ready to compete at the scheduled time, they forfeit their attempt at that event.

A 6.3 Testing and Work Safety

- A 6.3.1 Competition organizers are not responsible for the use of the vehicles outside of their competition.
- A 6.3.2 The competition officials disassociate themselves from all activities of the teams besides their own competition and associated events.
- A 6.3.3 All teams are advised to follow common practices and common sense when working on the vehicle and when operating the vehicle, before, during and after a competition.
- A 6.3.4 The following listed requirements are considered the minimum for a testing/operating environment to qualify as safe. Following these guidelines does not guarantee safety under all circumstances:
- Driver wearing full protection gear according to T 13.3
 - Working AMS, APPS, ASSI, BSPD, EBS, ETC plausibility check, IMD, RES and TSAL if applicable
 - Rules compliant chassis and mounted Impact Attenuator (IA)
 - No other passenger cars, trucks etc. being parked or driven on the same premise at the same time, unless the areas are clearly separated
 - No running under low visibility conditions
 - No running at speeds above typical event speeds
 - No running in areas where crashing into obstacles at the height of the driver's head is possible, such that parts of the vehicle may pass below an obstacle, but the driver's head can be trapped between the obstacle and the main hoop for example
- A 6.3.5 Organizers reserve the right to disqualify a team registered for their competition in case of unsafe driving behavior, especially if the reputation of the competition, sponsors and other teams is compromised. Examples of what could be seen as "unsafe driving behaviour" are wheel-to-wheel racing or racing in unsuitable events, e.g. hill climb races or drag races, depending on the respective circumstances.

A 6 General Rules

A 6.4 Onsite Working Safety

- A 6.4.1 Everyone in the dynamic area and everybody working on the vehicle must wear appropriate, closed-toed shoes.
- A 6.4.2 Appropriate personal protective equipment must be used.
- A 6.4.3 Any operation producing litter or debris, e.g. cutting of carbon fiber, should not be performed in the pits.
- A 6.4.4 When jacking up the vehicle a safe and stable support device rated for the load must be used.

A 6.5 Alcohol, Drugs and Illegal Material

- A 6.5.1 The use of alcohol or any other drug is strictly prohibited on the competition site. If any team member is tested with an alcohol level higher than 0.0‰ or positive for drugs, they will be disqualified for the rest of the competition immediately. A second team member being found to have an alcohol level higher than 0.0‰ or positive for drugs results in the entire team being disqualified immediately.
- A 6.5.2 Weapons or other illegal material are prohibited on the competition site.

A 6.6 Vehicle Movement

- A 6.6.1 Vehicles must not move under their own power anywhere other than on the practice or competition tracks.
- A 6.6.2 [EV ONLY] The detachable handle or key of the Tractive System Master Switch (TSMS) must be completely removed and kept by an ESO. The lockout/tagout function of the TSMS, see EV 6.2.2, must be used.
- A 6.6.3 For vehicles with an AS, the detachable handle or key of the Autonomous System Master Switch (ASMS) must be completely removed and kept by an ASR. The lockout/tagout function of the ASMS, see T 14.5.8, must be used.
- A 6.6.4 Vehicles must be pushed at a normal walking pace by means of a “push bar”, see T 13.1, and with a team member in the cockpit wearing the required driver equipment as defined in T 13.3 except for helmet, arm restraints and balaclava.
- A 6.6.5 The team member in the cockpit must have full control of steering and braking.
- A 6.6.6 When the push bar is attached to the vehicle, the engine/TS must remain switched off.
- A 6.6.7 Vehicles with wings are required to have two team members walking on either side of the front wing whenever the vehicle is being pushed.

A 6.7 [CV ONLY] Engine Running

- A 6.7.1 Running engines is not allowed in the pits.
- A 6.7.2 Engine running and hybrid system activation is allowed in the engine test area and in the dynamic area, when the following conditions are met:

A 6 General Rules

- The vehicle must have passed mechanical inspection.
- The vehicle must be jacked using the jacks, see T 13.2.
- A driver, wearing required driver equipment, see T 13.3, must be seated in the cockpit.
- A fire extinguisher must be immediately available.
- Driven wheels can only remain fitted to the vehicle if they will not rotate.
- No one is allowed under the vehicle while the engine is running.

A 6.7.3 Cranking engines in the pits is allowed, when the following conditions are met:

- The vehicle has passed mechanical inspection.
- The driven axles are securely jacked up.
- Gearbox is in neutral.
- All driven wheels are removed.
- Connectors to all injectors and ignition coils are detached.
- A fire extinguisher must be placed next to the engine.

A 6.8 Fueling and Hazardous Waste

A 6.8.1 Fueling may only take place at the official fuel station.

A 6.8.2 Open fuel containers are not allowed at the competition.

A 6.8.3 Disposal procedures for hazardous waste, like oil and battery cells, are defined in the competition handbook.

A 6.9 [EV ONLY] Working on the Vehicle

A 6.9.1 All activities require the TSAL to be green.

A 6.9.2 A prominent manual sign indicating the “TSAL green” state must be present whenever the LVS is switched off and the requirements for an only green TSAL according to EV 4.10 are met.

A 6.9.3 All activities on the vehicle, except when working on an active TS, require the High Voltage Disconnect (HVD) to be removed.

A 6.10 [EV ONLY] Working on the Tractive System

A 6.10.1 Activities on the TS, except for the accumulator, see A 6.11, must take place in the pit.

A 6.10.2 All activities require the attendance of the ESO.

A 6.10.3 For activities on the inactive TS, the following procedure must be carried out:

- The vehicle must be barred from anyone not involved in the work, by using barrier tape.
- The Tractive System Master Switch (TSMS) must be switched off.

A6 General Rules

- It must be assured that the TS cannot be activated by, at a minimum, using the lockout/tag out of the TSMS.
- A check for zero-potential must be carried out.
- A sign that declares the vehicle is electrically safe must be installed. The name of the ESO who is supervising the activities must be noted on the sign. This ESO is the only person who may remove the sign and the barrier.

A 6.10.4 In case of measurements on the active TS or an activation of the TS in the pit for testing purposes, the following steps must be followed:

- The vehicle must be barred from anyone not involved in the work, by using barrier tape.
- The vehicle must be jacked up and the driven wheels removed.
- One team member must be prepared to push a shutdown button at any time.
- The TS must only be activated for as long as necessary.
- Appropriate insulated tools and equipment must be used.
- Safety glasses with side shields and compliant safety gloves must be worn by all participating team members when parts of the TS are exposed.
- No other work on the vehicle is allowed when the TS is active.

A 6.10.5 If the TSAL is flashing red or malfunctioning, the TS is considered as active.

A 6.10.6 There must be at least one team member present, who is not directly involved in the work, but who could assist in case of an incident.

A 6.11 [EV ONLY] Working on Tractive System Accumulators

A 6.11.1 Opening or working on Tractive System Accumulator Containers (TSACs) is only allowed in the provided work places in the charging area, see A 6.12.

A 6.11.2 All activities require the attendance of an ESO.

A 6.11.3 Whenever the TSACs are opened, the cell segments must be separated with the maintenance plugs, see EV 5.4.4.

A 6.11.4 Appropriate insulated tools and equipment must be used.

A 6.11.5 Safety glasses with side shields and compliant safety gloves must be worn by all participating team members.

A 6.11.6 There must be at least one team member present, who is not directly involved in the work conducted on the accumulator, but who could assist in case of an incident.

A 6.11.7 Moving accumulator cells and/or accumulator segment(s) around at the competition site is only allowed if they are inside a completely closed TSAC.

A 6.11.8 All parts and modules of the TSAC that are not currently being worked on must be covered at least according to IPxxB while working on the accumulator container.

A6 General Rules

A 6.12 [EV ONLY] Charging

- A 6.12.1 There will be a separated charging area on the competition site. Charging TS accumulators is only allowed inside this area.
- A 6.12.2 Accumulators must be removed from the vehicle and placed on the TSAC hand cart, see EV 8.1, for charging.
- A 6.12.3 No grinding, drilling, etc. is allowed in the charging area.
- A 6.12.4 At least one team member who has knowledge of the charging process must stay with the accumulator(s) during charging.