



VDE E-Race

Formula Student Norddeutschland

Schwedt/Oder

13. - 16. June 2024

Version 1.1

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Changelog

This section contains only the major changes of the rules' intentions. Changed wording will not be displayed.

We recommend reading through all the rules anyway to ensure that mistakes are avoided.

| Chapter | Version | Release Date | Change |
|---------|---------|--------------|---------------------------------------------------------------------|
| - | 1.0 | 01.02.2024 | Initial release |
| 7 | 1.1 | 20.04.2024 | Defined P_{max} for autonomous disciplines in DriverMore Category |

0 Contact

If there are any questions regarding the event, please visit our homepage (www.erace-v.de) or contact us via e-mail: info@erace-v.de.

1 General Information

The VDE E-Race is a Formula Student style, international design competition which takes place every year in Northern Germany.

The main target of the VDE E-Race is to give the participating teams the possibility of advanced preparation for the official Formula Student events in summer. Therefore, we will have some static as well as dynamic events where all teams are able to test their skills, receive professional feedback, compare themselves with others, and gather experience.

Furthermore, we will offer additional events and competitions to strengthen the network between the participants of different teams. Wait and see!.

Check our website (www.erace-v.de) and follow us on social media (@vde_erace) to stay up to date if any changes in the schedule or the rules are made.

Every team is responsible to meet the deadlines of the competition.

The official event language is English.

1.1 Location and Date

The VDE E-Race will take place in Schwedt/Oder (Germany) from 13 June 2024 to 16 June 2024. For detailed information about the location see [Directions](#) and [Site plans](#).

1.2 Important Dates

The following table provides an overview over important dates and deadlines for the VDE E-Race 2024.

| Start | End | Designation | Rule |
|-------------------------------|------------|-------------------------------------|------------------------------------------|
| Registration Deadlines | | | |
| 14.02.2024 | 07.03.2024 | Team Registration | Team Registration |
| - | 10.03.2024 | Publication of Registration Results | Team Registration |
| - | 16.03.2024 | Registration Fee Payment | Registration Fee |
| 18.03.2024 | 04.04.2024 | Main Team Member Registration | Team Member Registration |
| - | 20.04.2024 | Additional Registration Fee Payment | Registration Fee |
| 05.04.2024 | 01.06.2024 | Late Team Member Registration | Team Member Registration |
| - | 13.06.2024 | Late Registration Fee Payment | Registration Fee |
| Competition Deadlines | | | |
| - | 01.06.2024 | Statics Document Upload | Static Events |

Note: All information about a certain deadline can be found in the rules. The deadline time is 13:00 CET between 1 January 2024 and 30 March 2024 and 13:00 CEST between 31 March 2024 and 26 October 2024.

1.3 Directions

Address Event Site

Harbor of Schwedt
 Neuer Hafen
 16303 Schwedt/Oder
 Germany

Address Campground and Pit Area

Regattastraße 1
 16303 Schwedt/Oder
 Deutschland

1.4 Event Schedule

The following section should provide a rough idea of the event schedule and how the different disciplines are distributed over the days. A detailed event schedule will be published in an additional document shortly before the event.

Thursday

- Start of the event (around noon)
- On-site registration (in the first 3 hours of the event)
- Technical Inspection (afternoon and evening)
- Engineering Design Event (afternoon and evening)
- Cost and Manufacturing Event (afternoon and evening)

Friday

- Engineering Design Event (whole day)
- Cost and Manufacturing Event (whole day)
- Business Plan Presentation (whole day)
- Technical Inspection (whole day)
- Acceleration [DV] (evening)
- Night Acceleration [DM] (evening)

Saturday

- Engineering Design Event (morning)
- Skid Pad [DM/DV] (morning)
- AutoX [DM/DV] (afternoon)
- Track drive [DV] (afternoon)
- Endurance [DM] (afternoon)

Sunday

- Clean up (morning)
- Departure (around noon)

The pits at the campsite will be open 24 hours but the dynamic area at the harbor will be closed for the time when no dynamic events are scheduled.

1.5 Officials



Carl Johann Giest
General Coordination



Nicole Geier
General Coordination



Janine Alt
Event Support / TI



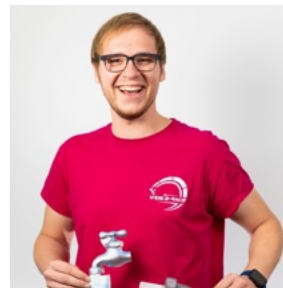
Inès Tchidou
Event Support / Statics



Jenny Stratmann
Statics



Hanna Werner
Statics



Jannek Alpen
Event Infrastructure



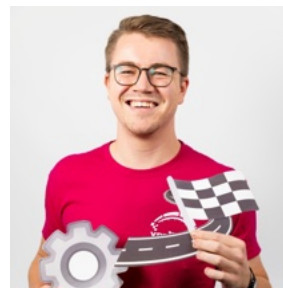
Torge Möller
Event Infrastructure



Tom Westendorff
TI / Dynamics



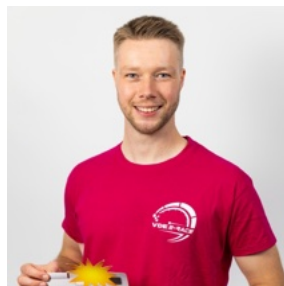
Victor Lubkowitz
TI / Dynamics



Bjarne Schwarz
TI / Dynamics



Anne Walther
Marketing / PR



Timon Suhk
Marketing / PR



Lukas Krebs
External Relations

1.5.1 Event Control

There will be no central event control, which is available all the time, instead everyone who is wearing a pink shirt may be approached to ask general questions. If there are specific questions e. g. concerning specific disciplines, try to find a pink shirt who is responsible for this context.

2 Registration

2.1 Teams

The event is limited to 10 active (DriverMore + DriverLess) and 2 alumni (DriverOld) teams.

The active teams should aim to participate with their current car and take part in static and dynamic events.

The alumni teams are only participating in the dynamic events and alumni team members are welcome to support the judging of the static events.

| Category | Drivetrain | Number |
|------------------|------------|--------|
| DriverMore [DM] | EV / CV | 10 |
| DriverLess [DV] | EV | |
| DriverOld [DOld] | EV / CV | 3 |

2.2 Team Registration

Teams will be able to register for the event on our homepage (www.erace-v.de) during the *Team Registration* period defined in the section [Important Dates](#) of the VDE E-Race rules.

The registration slots will be assigned to the teams in the following order:

- VDE Teams
- VDE Supporters
- Other Teams (based on first come first served principle)

The option to register a team will be available on the competition website as soon as the registration period starts. As mentioned before, it is recommended to register quickly after the start of the registration, as slots are limited and order is partly based on first come first served principle.

After the submission, the application will be checked by the officials and the team may appear on the competition website.

Additionally, every team has to indicate how many team members they intend to participate with in the VDE E-Race (see [Team Member Limit](#)).

On the date of *Publication Of Registration Results*, we will inform all teams who filled in the registration form within the given period about the state of their registration through their provided contact e-mail address. If the number of registrations exceeds available slots we will open a waiting list. We might also publish the results on the competition website and on social media.

All accepted teams will receive an invoice for the registration fee soon after the end of the team registration period. The registration fee (see [Registration Fee](#)) has to be paid until the *Registration Fee Payment* deadline defined in section [Important Dates](#) of the VDE E-Race rules. If a team fails to pay the correct amount within the given time the team will be withdrawn from the competition and the first team on the waiting list will receive the slot.

The withdrawn team can request to be registered again and might then be added to the end of the waiting list.

2.3 Team Member Registration

Team members must register themselves on the competition website. In the registration process, each person is asked to choose their team. The list of registered team members will be accessible through an individual link provided to the teams contact e-mail.

It is the responsibility of each team to regularly check the list of registered team members and inform the officials (info@erace-v.de) if there are any false registrations.

The registration period for team members is splitted into the main registration and the late registration period. The times of these periods are given as *Main Team Member Registration* and *Late Team Member Registration* in section [Important Dates](#) of the VDE E-Race rules.

2.3.1 Team Member Limit

We have to limit the number of participants to 250 due to the infrastructure on site. As there are larger and smaller teams, we do not want to set a fixed maximum number of team members per team. Instead, every team is required to provide an estimation on how many of their team members will probably attend the event. This estimation has to be provided during [Team Registration](#).

Based on the estimations of all teams the officials will define a fair amount of team member slots for every team. All participating teams will be informed about their individual number of slots in the *Announcement Of Registration Results* e-mail. If a team from the waiting list is moving forward to be registered it will get the same amount of slots as the withdrawn team.

2.4 Registration Fee

The registration fee for the VDE E-Race is € 15,00 p. p. for VDE members and € 30,00 p. p. for non-members (minimum 150 € per team).

Based on these amounts, an individual registration fee is calculated for every team. As soon as the team registration is over, every registered team has to pay an initial registration fee of € 150,00 until the *Registration Fee Payment* given in [Important Dates](#).

Teams on the waiting list have to pay their fee as soon as they are moved to be registered.

As soon as the main team member registration period is over, the individual registration fee of every team is calculated. If this fee is higher than € 150,00, an additional invoice covering the additional registration fee is sent to the team and has to be paid until the *Additional Registration Fee Payment* deadline given in [Important Dates](#).

The registration fee for team members registered during the *Late Team Member Registration* period given in [Important Dates](#) is € 50,00 regardless of the membership state in the VDE. So it is really recommended to meet this deadline of the *Main Team Member Registration*. If there are late registrations for a team it will receive an additional invoice which has to be paid until the *Late Registration Fee Payment* which is set to the start of the competition.

It is allowed to exchange team members during the the *Late Team Member Registration* period without additional costs. To request an exchange, contact the officials via info@erace-v.de

The following examples should provide a better understanding of the complicated calculation of the individual registration fees:

Example 1: A team registers 20 VDE members (€ 300,00) and 5 non-members (€ 150,00) → This team has to pay € 150,00 after the *Team Registration (Registration Fee Payment)* and € 300,00 after the *Main Team Member Registration (Additional Registration Fee Payment)*.

Example 2: A team registers 10 VDE members (€ 150,00) → This team has to pay € 150,00 after the *Team Registration (Registration Fee Payment)*.

Example 3: A team registers 5 VDE members (€ 75,00) → This team has to pay € 150,00 after the *Team Registration (Registration Fee Payment)* (there will be no refund).

Example 4: A team registers 10 VDE members (€ 150,00) and 5 non-members (€ 150,00) and

additionally 2 VDE members and 3 non-members during *Late Team Member Registration* (€ 250,00) → This team has to pay € 150,00 after the *Main Team Registration (Registration Fee Payment)* and € 300,00 after the *Main Team Member Registration (Additional Registration Fee Payment)* and € 250,00 after the *Late Team Member Registration (Late Registration Fee Payment)*.

| Registration period | Fee | Corresponding Payment Deadline |
|-------------------------------|--------------------------------------------------|-------------------------------------|
| Team registration | € 150,00per team | Registration Fee Payment |
| Main Team Member Registration | € 15,00 per VDE member € 30,00 per non-member | Additional Registration Fee Payment |
| Late Team Member Registration | € 50,00 per person | Late Registration Fee Payment |

Note: VDE membership is only available for people living in Germany. International teams please contact the officials before the *Main Team Member Registration* period to figure out a suitable solution (info@erace-v.de).

There will be no refunds of any registration fee for any reason. Late payment may cause losing the guaranteed starting place and being listed at the end of the waiting list.

2.5 On-Site-Registration

On-site-registration will take place at the event control and will be possible during the first 3 hours on the first day of the competition (usually Thursday). Only the Team Captain or his/her deputy will be able to register the team. Make sure to bring the VDE E-Race consent form, duly signed by all registered team members.

At the event control, every team will receive a VDE E-Race Event Package including e.g. registration passes, dynamic area passes, static event documents etc. Large teams may bring one or two extra people to help carry.

2.6 ESO / ASR Assignment

Each team has the possibility to register as many ESOs / ASRs as they want. It is recommended to register all ESOs and ASRs during on-site registration. In general, a late registration is possible, but the availability of the responsible pink shirts might be limited during the event so that may take some time. At registration, all ESOs / ASRs must show a proof of qualification according to current Formula Student-Rules.



Each EV team has to register at least one ESO.

Each DV team has to register at least one ASR.

If there is only one ESO / ASR in a team this person must not be a driver.

2.7 Driver Assignment

Each DM team has to register a minimum of 4 drivers and a maximum of 6 drivers to compete in the dynamic disciplines. Additional drivers can be registered to drive the car on the test track (these are not allowed to participate in the official disciplines).

Also, DV teams have to register a driver for the manual brake test and if they want to go in manual mode on the test track.

It is recommended to register all drivers during on site registration. In general, a late registration is possible but the availability of the responsible pink shirts might be limited during the event so that may take some time. Drivers need to bring their student ID and driver's license for registration. Drivers of DOld teams only need to bring their driver's license.

3 General Rules

3.1 General Technical Requirements

Every team must bring a self-constructed single-seated race car in order to participate in the competition.

Every participating vehicle must be built according to FSAE or Formula Student-Rules (valid in the year when the vehicle first participated in an official event) and pass the technical inspection before it is allowed to drive on the test track and participate in the dynamic events.

We strongly recommend participating with the current vehicle (even if it is not finished and ready to race) in order to get the maximum experience and benefit (especially through the feedback on static events and technical inspection) out of this pre-event.

3.2 Competition Categories

There will be three competition categories at the VDE E-Race:

- DriverMore [DM]
- DriverLess [DV]
- DriverOld [DOld]

In general the purpose of the competition is to prepare teams and their current vehicles for the official competitions later in the season. However it is also possible to join the event with an older car and get feedback and training on Static Event and Technical Inspection. All disciplines taken with a non-first-year vehicle can be scored in the DriverOld category.

3.2.1 DriverMore

The Drivermore category is open for first year vehicles built according to the EV / CV sections of the current version of the Formula Student rules. At the VDE E-Race, EV and CV cars will be scored together in this category.

All cars which have not participated in an official World Ranking List Formula Student event (see <https://www.formulastudent.de/world/competitions/>) are considered to be first year vehicles.

3.2.2 DriverLess

The Driverless category is equivalent to the Driverless Cup which means that every car will compete in additional Driverless disciplines with the same car which is also competing in the Drivermore category.

3.2.3 DriverOld

The DriverOld category is meant to encourage alumni to experience the joy of VDE E-Race and *show the young jumpers how the rabbit is running*. Because as we all know: *“Earlier was everything better”*.

If you are interested in joining the VDE E-Race with your alumni team, feel free to contact us via e-mail at info@erace-v.de. It is much appreciated when participating alumni teams support us in judging the static events and technical inspection.

3.3 Charging and Working on the car

There will be a charging area where the HV accumulators can be charged. The charging area will be available on a regular basis during the day and in special cases on request.

If the tractive system is activated in the pit, all necessary safety precautions have to be met. This includes closing the pit with suitable caution tape to reduce the number of people in the pit to a minimum and to lift all driven wheels from the ground and remove the tires.

It is only allowed to open the accumulator in the charging area during the opening hours. This must be supervised by an official. Violating this rule will lead to the disqualification of the whole team.

3.4 Team Captains, Drivers and ESO/ASR Briefing

The team captains, drivers, and ESO / ASR briefing will take place every morning.

This briefing is mandatory for all team captains, ESOs, and ASRs who are responsible for the car on that particular day (no matter if it is for statics, dynamic events or technical inspection). It is also mandatory for all drivers who want to drive the car on the test area or during dynamics on that day.

Drivers, ESOs and ASRs who do not attend the briefing or come late are not allowed to operate the car in technical inspection, dynamic disciplines and on the test track for that particular day.

3.5 General Guidelines

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 to ensure a safe and efficient operation.

All team members are required to cooperate with and follow all instructions of the officials. Official announcements shall be considered part of these rules.

All guidelines and clarifications posted in the *Rules and Important Documents* sections on the competition website for the current season are considered part of the rules.

Questions concerning the meaning or intent of the rules will be resolved by the officials.

3.5.1 Alcohol

Alcohol is strictly forbidden at the harbor and in the pit area (this includes the pits of other teams).

Drinking alcohol is only allowed in the social area on the campground. You are not allowed to bring it to the pit area and the harbor – even if it is inside your body.

Along with the fun we want a safe competition. Therefore, we might conduct alcohol testing (breathalyzers) during the event. The permitted alcohol level in the aforementioned areas for any participant is 0 ‰. Every team member tested with an alcohol level higher than 0 ‰ in the pit area or at the harbor will lead to a penalty for the whole team which is determined by the officials. A second team member of the same team tested with more than 0 ‰ in these areas will lead to the disqualification of the team.

3.5.2 Smoking

Smoking (including Shisha) is only allowed in designated smoking areas. These will be announced during the welcome ceremony.

3.5.3 Pit and Dynamics Ground Conditions

It is the responsibility of every team to leave the pit ground in the same or a better condition as it was in the beginning of the competition. It is required that no dirt or fluids leave residues on the ground and that the nearby river does not get contaminated by any kind of fluids like oil, degreaser or brake fluids. Therefore, it might be required to cover the pit ground with a suitable underlay. Any accidents or contaminants should be directly removed and reported to the officials.

The same requirements are valid for the condition of the dynamic area. If a car is losing fluids anywhere at the harbor it is the team's responsibility to clean up the contaminated area and to take actions to prevent leakage in the future.

3.5.4 Harbor

It is strictly forbidden to go into the water in and around the harbor. It is not allowed to dispose of any kind of waste into the water.

For your own safety you are not allowed to climb any kind of harbor equipment (like cranes) and lanterns.

A violation of the rule will lead to a disqualification of the whole team.

4 Technical Inspection

The Technical Inspection at the VDE E-Race will be according to Formula Student rules and aims to prepare all teams for the requirements at the official events. Therefore, it is recommended to participate with the current car in order to gather some valuable feedback from official scrutineers.

4.1 General Information and Procedure

The Technical Inspection will be held according to Formula Student rules and specifications. Every car needs to pass the Technical Inspection successfully in order to participate in the dynamic events. Every car must pass the Technical Inspection according to the rules which applied when the car was built, even if the car already passed a Formula Student Technical Inspection. The team must bring a printed copy of the FSG or FSA inspection sheet valid for the respective vehicle (DIN A4, printed on one side, stapled together at the top left) to the Technical Inspection.

The Technical Inspection order is first come, first serve.

The Technical Inspection will take place in the pits.

If you want to start the Technical Inspection, your car must be in ready-to-race condition. Besides that, a maximum of four team members and the inspection sheet need to be present.

It is also recommended to have the rules in print version as well as an electrical device with search function since these may help you to pass the Technical Inspection faster. You should also prepare all the necessary documents (in printed or digital form) to prove that the vehicle has been built in accordance with current rules. Particular attention should be paid to the documentation of solutions that are difficult or impossible to check during the inspection.

In order to allow quick checks in the dynamic area if all parts of the technical inspection are passed you will receive event stickers. The main sticker will have the following dimensions: 50 mm height x 150 mm length. You have to place it somewhere next to the driver's compartment where it is clearly visible while standing next to the car.

4.2 Special aspects of technical inspection at the VDE E-Race

You may pass the technical inspection and compete in the dynamic events of the VDE E-Race or use the test area without your vehicle fully complying with the rules. The technical inspector decides whether a vehicle is in a technical condition that allows it to be operated at the event. If a team decides not to correct all rule deviations classified as non-critical by the technical inspector during the event, this has the following consequences:

- To ensure a fair competition, for every missing point in the inspection sheet there will be 5 points deducted from the team's overall scoring.
- The technical approval sticker is punched in the center.

All points concerning the brake system, driver safety, TSAL, and drive train will be handled very strictly.

Certain failures discovered during the inspection might be accepted by the VDE E-Race. That means, even if you pass technical inspection at this event, you may fail at other competitions.

4.3 Order of technical checks

CV:

- Mechanical Inspection
- Weight (maybe Tilt)
- Noise
- Brake

EV: You are supposed to go for electrical inspection first but you are allowed to start with mechanical inspection. In this case, the high voltage accumulator must be in the car, but must not be connected. Thus, different points need to be checked twice. We will only offer this, if it is necessary in case of time problems. The standard order is:

- Electrical inspection – maybe accumulator check (decision pending)
- Mechanical inspection
- Weight (maybe tilt)
- Rain
- Brake

DV: Please have your vehicle checked in the order of your drive train (CV / EV). The function of the driverless system is subsequently inspected. Therefore the following tests need to be passed:

- Autonomous System Inspection
- EBS

4.4 Tilt test

If a tilt test setup will be available at the event, will be announced in a later version.

4.5 Rain test

If the weather conditions are very good, no rain test needs to be performed. The team captains will be informed in the morning at the team captains' briefing whether this is the case. If no rain test is carried out, EV vehicles must be taken out of operation immediately if there are any signs of rain. In the test area, the ESO of a team is responsible for taking a vehicle out of operation at an early point as soon as it starts to rain. If a vehicle is running in a dynamic discipline, it will be pulled out by the race director. The respective run will be scored as a DNF. Further:

- To ensure a fair competition, there will be 25 points deducted from the team's overall scoring.
- The rain test approval sticker is punched in the center.

5 Static Events

5.1 General Information (Statics)

As the aim of the E-Race is to prepare you as well as possible for the Formula Student events, we put a special focus on the Statics. That's why the points distribution for the Statics is relatively higher, so it pays off even more to be prepared (see [Scoring](#)).

In case of any questions, you can reach out to the Static team via e-mail (statics@erace-v.de).

Note: Teams not competing in the dynamics with a first year vehicle may still present Statics in accordance with their first year vehicle to gather some feedback or may use the time for a detailed Q&A session with the judges. Just contact the officials before the competition to plan the session accordingly.

5.2 Business Plan Presentation

5.2.1 Objective

The objective of the Business Plan Presentation (BPP) is to evaluate the team's ability to develop and deliver a comprehensive business model showing how their product could become a rewarding business opportunity. The judges should be treated as if they were potential investors or partners for the presented business model. The business plan must relate to the specific prototype race car entered in the competition. The actual quality of the prototype itself will not be considered part of the BPP judging (Formula Student Rules – S11.).

The BPP at the VDE E-Race will be slightly different from the official Formula Student events. The most important change is that there is **no Deep Dive Topic** for the BPP. Due to that, the presentation time is only 8 minutes.

You can use any presentation tool you want. We will provide a projector or display with an HDMI or VGA cable, so make sure you are prepared for both. Before your presentation starts, please check if all of your devices are compatible with the given equipment. Teams planning to use other presentation equipment are responsible for bringing it themselves.

5.2.2 Business Plan Pitch Video

As soon as the team registration phase is closed and it is published who will be taking part in this year's VDE E-Race, the form for uploading the Business Plan Pitch Video will be published. Submit it through the form by the deadline for uploading the static documents specified in the

section [Important Dates](#). In case of problems with the form send a request via e-mail to statics@erace-v.de.

We try to provide feedback for late submitted documents but in order to guarantee a fair competition you will receive zero points for the *Pitch Video* (see [Static Events Scoring](#)).

5.2.3 Procedure

One or more team members may present the business concept. All team members involved in the BPP must be in the podium area and must be introduced to the judges at the beginning of the presentation.

The team members who have been introduced may answer the judges' questions even if they were not actually presenting (Formula Student Rules – S 1.2.).

Teams that fail to make their presentation during their assigned time period will receive zero points for the BPP (Formula Student Rules – S 1.2.).

It will be possible to bring additional team members (from your team or another) to see the presentation and take notes.

5.3 Engineering Design Event

5.3.1 Objective

The concept of the design event is to evaluate the students' engineering process as well as the effort that went into the design of a vehicle, meeting the intent of the competition (Formula Student Rules – S 3.1.).

5.3.2 Engineering Design Report

As soon as the team registration phase is closed and it is published who will be taking part in this year's VDE E-Race, the form for uploading the Engineering Design Report will be published. Submit it through the form by the deadline for uploading the static documents specified in the section [Important Dates](#). In case of problems with the form send a request via e-mail to statics@erace-v.de.

We try to provide feedback for late submitted documents but in order to guarantee a fair competition you will receive zero points for the *EDR* (see [Static Events Scoring](#)).

5.3.3 Content

The engineering design event at the VDE E-Race will be similar to the one at the official Formula Student Events (Formula Student Rules – S3). Prepare everything as you would do it for any other event. Bring supporting material like drawings, pictures, videos, and similar to support your arguments and to visualize your design process to the judges.

5.3.4 Procedure

The engineering design event will take place in the pits.

Next to the race car, you will present your construction and design decisions to the judges. In a question-answer-discussion they evaluate the design process of the race car. The discussion is limited to a maximum of forty minutes.

After the discussion you will get a short feedback and some hints on how you can improve for the upcoming events.

5.4 Cost and Manufacturing Event

5.4.1 Objective

The objective of this discipline is to evaluate the team's understanding of the manufacturing process and costs associated with the construction of a prototype race car. This includes trade-off decisions between content and cost, make or buy decisions, and understanding the differences between prototype and mass production (Formula Student Rules – S 2.1.).

5.4.2 Cost Report Documents

All Cost Report documents (BOM including DBOM and CBOM), supporting material file and cost explanation file are required for participating in this event. BOM, DBOM, and CBOM should be created with the FSG Cost tool online and exported as pdf.

As soon as the team registration phase is closed and it is published who will be taking part in this year's VDE E-Race, the form for uploading the documents will be published. Submit them through the form by the deadline for uploading the static documents specified in the section [Important Dates](#). In case of problems with the form send a request via e-mail to statics@erace-v.de.

We try to provide feedback for late submitted documents but in order to guarantee a fair competition you will receive zero points for the *BOM and BOM discussion* (see [Static Events Scoring](#)).

5.4.3 Content

The cost and manufacturing event at the VDE E-Race will be similar to the one at the official Formula Student Events (Formula Student Rules – S 2). Therefore, we ask you to prepare yourselves as you would do it for every other judging.

DBOM will be “Suspension”.

CBOM will be “Engine and Drivetrain”.

5.4.4 Procedure

The cost and manufacturing event will take place in the pits. Next to the race car, you will present your BOM and manufacturing decisions to two judging groups. In a question-answer-discussion they evaluate the manufacturing process of the race car. The discussion is limited to a maximum of forty minutes and will be split into “Bill of Material (BOM) Discussion” and “Cost Understanding”.

After the discussion you will get a short feedback and some hints how you can improve for the upcoming events.

6 Dynamic Events

The dynamic events will take place in the dynamic area. Every aspect that is not specifically defined in the following section will be conducted according to the current Formula Student rules.

6.1 Access to Dynamic Area

The access to the dynamic area is only allowed to a limited number of participants per team. Every team will receive four dynamic area passes. With these passes four team members may enter the dynamic area.

Drivers may take them off while sitting in the car and give them to another team member already wearing a pass.

6.2 Testing

Testing is only allowed in the testing area after passing the Technical Inspection.

If the tractive system is activated or the IC engine is fired up in the pit lane, make sure that all necessary safety precautions are met as stated in section [Charging and Working on the car](#).

6.3 Dynamic Disciplines

The following dynamic disciplines will be part of the VDE E-Race:

| Dynamic discipline | Category |
|-----------------------|----------------------|
| Acceleration | [DM] / [DV] / [DOld] |
| Skid Pad | [DM] / [DV] / [DOld] |
| AutoX | [DM] / [DV] / [DOld] |
| Endurance | [DM] / [DOld] |
| Trackdrive | [DV] |
| Efficiency (optional) | [DM] / [DV] |

The running order for the Endurance and Trackdrive events will depend on the result in the AutoX event.



According to Formula Student Rules, the points scored in autonomous Skid Pad and Acceleration will also count into DM overall result.

There may be an Efficiency scoring at the VDE E-Race. That depends on the availability of official Energy Meters according to FSG specifications. If they are available at that time, they will be used. So please consider the space and connections in your car.

Notes on the discipline Acceleration: For driverless vehicles (DV), the discipline is held in the early evening so that daylight conditions prevail.

The discipline for vehicles with drivers (DM) takes place during sunset. Sufficient lighting will be provided so that the discipline can be carried out safely. As last year, we are once again appealing to your creativity at this point. A night race is based on an interesting light show. So think back to your tuning time at *Need for Speed* and show everyone how a vehicle is displayed properly. No permanent modifications or additional elements may be installed after Technical Inspection. To ensure that these modifications do not endanger drivers or track marshals, have them briefly checked by a scrutineer.

7 Scoring

In the following tables, maximum points per discipline are listed. For the detailed calculation, refer to the concerning chapters.

| DriverMore | Points |
|------------------------------|---------------|
| Engineering Design Event | 300 |
| Cost and Manufacturing Event | 150 |
| Business Plan Presentation | 150 |
| Autonomous Acceleration | 50 |
| Acceleration | 25 |
| Autonomous Skid Pad | 50 |
| Skid Pad | 25 |
| AutoX | 100 |
| Endurance | 200 |
| Efficiency | 50 |
| Total | 1100 |

| DriverLess | Points |
|-------------------|---------------|
| Acceleration | 75 |
| Skid Pad | 75 |
| AutoX | 100 |
| Trackdrive | 250 |
| Efficiency | 100 |
| Total | 600 |

| DriverOld | Points |
|--------------|-------------|
| Acceleration | 200 |
| Skid Pad | 200 |
| AutoX | 200 |
| Endurance | 400 |
| Total | 1000 |

7.1 Static Events Scoring

| Engineering Design Event | |
|----------------------------------------|------------|
| Overall Vehicle Concept and Innovation | 40 |
| Vehicle Dynamic | 20 |
| Vehicle Performance / Aerodynamics | 60 |
| Mechanical / Structural Engineering | 20 |
| Tractive System / Powertrain | 40 |
| LV-Electrics / Electronics / Hardware | 20 |
| Autonomous Functionality | 60 |
| Driver Interface | 20 |
| Engineering Design Report | 20 |
| Total | 300 |

| Cost and Manufacturing Event | |
|----------------------------------------|------------|
| Format and Accuracy of Documents | 10 |
| Knowledge of Documents and Vehicle | 10 |
| BOM and BOM discussion | 50 |
| Discussion Part 2 “Cost Understanding” | 50 |
| Part 3 “Real Case” | 30 |
| Total | 150 |

| Business Plan Presentation | |
|-----------------------------------|------------|
| Preparation | 15 |
| Pitch Video | 15 |
| Content | 30 |
| Finances | 15 |
| Demonstration and Structures | 20 |
| Delivery | 15 |
| Questions | 15 |
| General Impression | 25 |
| Total | 150 |

7.2 Static Events Penalties

If a team does not show up for a judging session for any static event session, there will be a penalty of 50 points. It is possible to deregister from a static event or change slots until 24 h before the judging starts.

Any change request needs to be communicated to statics@erace-v.de.

7.3 Dynamic Events Scoring

The following chapter describes how the scores for the Dynamic Events are calculated. If a factor other than 1 is applied to P_{max} the difference is given to every team that completes the respective discipline without DNF.

| Discipline | Scoring Formula |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Manual Acceleration [DM][DOld] | $AccelerationScoreManual[DM] = 0.95 \cdot P_{max} \cdot \left(\frac{T_{max} - 1}{T_{team} \cdot 0.5} \right)$ <p>T_{max} is 1.5 times the time of the fastest vehicle including penalties. P_{max} are the max. points awarded for this discipline according to Scoring.</p> |
| Autonomous Acceleration [DM] | $AccelerationScoreAutonomous[DM] = P_{max} \cdot \frac{N_{all} + 1 - R_{DV,team}}{N_{all}}$ <p>$R_{DV,team}$ is the ranking of team's best driverless time including penalties within the best driverless times including penalties of all other teams. N_{all} is the number of teams who finished at least one manual or driverless run without DNF or DQ. P_{max} are the max. points awarded for this discipline according to Scoring.</p> |
| Acceleration [DV] | $AccelerationScore[DV] = 0.95 \cdot P_{max} \cdot \left(\frac{T_{max}}{T_{team}} - 1 \right)$ <p>T_{max} is 2 times the time of the fastest vehicle including penalties. P_{max} are the max. points awarded for this discipline according to Scoring.</p> |
| Manual Skid Pad [DM][DOld] | $SkidPadScoreManual[DM] = 0.95 \cdot P_{max} \cdot \left(\frac{T_{max} - 1}{T_{team} \cdot 0.25} \right)$ <p>T_{max} is 1.25 times the time of the fastest vehicle including penalties. P_{max} are the max. points awarded for this discipline according to Scoring.</p> |
| Autonomous Skid Pad [DM] | $SkidPadScoreAutonomous[DM] = P_{max} \cdot \frac{N_{all} + 1 - R_{DV,team}}{N_{all}}$ <p>$R_{DV,team}$ is the ranking of team's best driverless time including penalties within the best driverless times including penalties of all other teams. N_{all} is the number of teams who finished at least one manual or driverless run without DNF or DQ. P_{max} are the max. points awarded for this discipline according to Scoring.</p> |

| Discipline | Scoring Formula |
|------------|-----------------|
|------------|-----------------|

Skid Pad [DV]

$$SkidPadScore[DV] = 0.95 \cdot P_{max} \cdot \left(\frac{\left(\frac{T_{max}}{T_{team}} \right)^2 - 1}{1.25} \right)$$

T_{max} is 1.5 times the time of the fastest vehicle including penalties.
 P_{max} are the max. points awarded for this discipline according to [Scoring](#).

AutoX [DM][DOld]

$$AutoXScore[DM] = 0.95 \cdot P_{max} \cdot \left(\frac{\frac{T_{max}}{T_{team}} - 1}{0.5} \right)$$

T_{max} is 1.25 times the time of the fastest vehicle including penalties.
 P_{max} are the max. points awarded for this discipline according to [Scoring](#).

AutoX [DV]

$$AutoXScore[DV] = 0.9 \cdot P_{max} \cdot \left(\frac{T_{max} - T_{team,total}}{T_{max} - T_{min}} \right)$$

$$T_{team,total} = \min(T_{team,1}, \text{avg}(T_{team,1}, T_{team,2}))$$

$T_{team,1}$ is the team's time including penalties of run 1.
 $T_{team,2}$ is the team's time including penalties of run 2.
 T_{max} is the time for driving the lap with $6 \frac{m}{s}$.
 T_{min} is the time of the fastest $T_{team,total}$ of all teams.
 For runs that are DNF or DQ and for runs with a $T_{team,i}$ above T_{max} , $T_{team,i}$ is set to T_{max} .
 P_{max} are the max. points awarded for this discipline according to [Scoring](#).

Endurance[DM][DOld]

$$Endurance[DM] = 0.9 \cdot P_{max} \cdot \left(\frac{\frac{T_{max}}{T_{team}} - 1}{0.333} \right)$$

T_{max} is 1.333 times the time of the fastest vehicle including penalties.
 P_{max} are the max. points awarded for this discipline according to [Scoring](#).

Trackdrive [DV]

$$TrackdriveScore[DV] = 0.75 \cdot P_{max} \cdot \left(\frac{T_{max}}{T_{team}} - 1 \right)$$

T_{max} is 2 times the time of the fastest vehicle including penalties.
 Additional 10 points are awarded per complete Lap (10 laps in total)
 P_{max} are the max. points awarded for this discipline according to [Scoring](#).

| Discipline | Scoring Formula |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Efficiency [DM] | $EfficiencyScore = P_{max} \cdot \left(\frac{EF_{max} - EF_{team}}{EF_{max} - EF_{min}} \right)$ $EF = T^2 \cdot E$ $E[CV] = V_{fuel} \cdot 3.55 \frac{kWh}{l}$ <p>EF_{team} is the team's efficiency factor.</p> <p>EF_{min} is the lowest efficiency factor of all teams which were considered for efficiency.</p> <p>EF_{max} is defined as 1.5-time EF_{min}</p> <p>T is the uncorrected elapsed driving time.</p> <p>E is the used energy in kWh.</p> <p>V_{fuel} is the team's corrected used fuel volume.</p> <p>P_{max} are the max. points awarded for this discipline according to Scoring.</p> |

7.4 Dynamic Events Penalties

After a discipline, various aspects of the technical regulations can be checked again. Deviations will result in penalty points. The penalty points will be calculated according to Formula Student rules (see Formula Student Rules IN12).

Penalty points for driving errors or wrong/late queuing (only Endurance) are also assessed according to Formula Student rules (see Formula Student Rules D9).

7.5 General Penalties

Every violation of the rules during the competition may lead to a penalty for the team. The amount and nature of the penalty shall be determined by the officials.

7.6 Publishing Results

The results will be published on the event website and on the wall of champions. Check also our social media accounts to be always up to date.

7.7 Protesting

To protest a rule, score, judge's decisions, time or any other aspect of the competition, the team must present the issue to the event control for discussion, and possible resolution before the protest is led.

To lay a protest fill in the "Pro-Protest" form and hand it in at the event control. Protests can only be handed in by the team captain or his/her deputy.

Protests must be led within one hour after the action being protested has occurred or the scores for the activity involving the protest's subject are posted.

The protesting team must post a 25 points bond to be deducted from their score if the protest is denied. The decision of the officials regarding any protest is final.