Formula Student Electric
Rules 2015

Version 1.2.0
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1 Introduction

Since 2010 Formula Student Germany is organizing 2 Events, Formula Student Combustion (FSC) and Formula Student Electric (FSE). Both Events take place at the same dates and the same event site.

This rules document contains the Formula Student Germany rules for the Formula Student Electric Competition.

2 Important Dates

Note that for the following mentioned penalties regarding late submission of documentation 1 day exactly equals 24h.

2.1 Competition Dates and Place

July 28, 2015 to August 02, 2015
Formula Student Germany (FSG) will take place in Hockenheim/Germany.

2.2 Registration

2.2.1 Registration FSE

January 26th, 2015, 1200 CET

Registration forms will be accepted in the order in which they are received, starting January 26th, 2015, **1200 CET** and ending on February 23th, 2015, **1200 CET** or when the 40 cars registration limit is reached. Registration will be online at the FSG Website.

2.2.2 Early Registration

January 19th, 2015, 1200 CET

Early registrations will be accepted in the order in which they are received, starting January 19th, 2015, **1200 CET** and ending on January 25th, 2015, **1200 CET**, or when all early registration slots have been filled, whatever occurs first.

All remaining slots that are not used during early registration will then become available for all teams when Official Registration opens on January 26th, 2015.

2.3 Structural Equivalency Spreadsheet (SES)

March 27th, 2015, 1200 CET

IMPORTANT: ALL TEAMS MUST SUBMIT A STRUCTURAL EQUIVALENCY SPREADSHEET. A blank copy of this form is supplied on the Formula Student Germany Website

http://www.formulastudent.de/fse/2015/rules/

Additionally all teams must submit a 3 dimensional model of the frame / monocoque in “IGES” file format. The accumulator container(s) and attachment method must also be included.

The Structural Equivalency Spreadsheet and the 3D model must be uploaded to the 'My Team' area on the FSG website no later than March 27th, 2015, **1200 CET**.

Late submissions will be penalized with -10 (minus ten) points per each commenced day, up to a maximum of -70 points, which will be taken off the team’s Total Score.

Teams, which missed the SES or 3D model deadline by more than 7 days will be removed from the FSG 2015 competition.

In the event that the FSG Technical Committee requests additional information or calculations, teams have **7 days** from the date of the request to submit the requested information. Late submissions will be penalized with -5 (minus five) points per each commenced day, up to a maximum of -35 points, which will be deducted from the team's Total Score.

2.4 Impact Attenuator Data

March 27th, 2015, 1200 CET

IMPORTANT: ALL TEAMS MUST SUBMIT AN FSG IMPACT ATTENUATOR DATA FORM. A blank copy of this form is supplied on the Formula Student Germany Website

http://www.formulastudent.de/fse/2015/rules/

Impact Attenuator Data must be uploaded to the 'My Team' area on the FSG website no later than March 27th, 2015, **1200 CET**.

Late submissions will be penalized with -10 (minus ten) points per each commenced day, up to a maximum of -70 points, which will be deducted from the team's Total Score.

Teams, which miss the IAD deadlines by more than 7 days will be removed from the FSG 2015 competition.

In the event that the FSG Technical Committee requests additional information or calculations, teams have **7 days** from the date of the request to submit the requested information. Late submissions will be penalized with -5 (minus five) points per each commenced day, up to a maximum of -35 points, which will be deducted from the team's Total Score.

2.5 Electrical System Form

May 29th, 2015, 1200 CEST

IMPORTANT: ALL TEAMS MUST SUBMIT AN ELECTRICAL SYSTEM FORM. A WEB-BASED SYSTEM WILL BE PROVIDED ON THE FSG WEBSITE AND HAS TO BE USED.

The Electrical System Form must be completed on the FSG website no later than May 29th, 2015, **1200 CEST**.

Late submissions will be penalized with -10 (ten) points per each commenced day, up to a maximum of 70 points, which will be taken off the team's Total Score.

Teams which missed the ESF deadline by more than 7 days will be de-registered from the FSE 2015 competition.

In the event that the FSG Technical Committee requests additional information or calculations, teams have **7 days** from the date of the request to submit the requested information. Late submissions will be penalized with -5 (minus five) points per each commenced day, up to a maximum of 35 points, which will be taken off the team's Total Score.

2.6 Electric System Advisor Confirmation

March 6th, 2015, 1200 CET

IMPORTANT: ALL TEAMS MUST SUBMIT AN ELECTRIC SYSTEM ADVISOR CONFIRMATION, ESAC.

The ESAC must contain a SIGNED confirmation of your ESA that the vehicle has in principle been designed using good engineering practice. The ESAC also has to contain a short CV or other form of documentation which proves that your ESA has the necessary experience and education to assess the design of a battery powered electric vehicle with respect to safety.

The ESAC must be uploaded to the 'My Team' area on the FSE website no later than March 6th, 2015, **1200 CET**.

Late submissions will be penalized with -10 (ten) points per each commenced day, up to a maximum of 70 points, which will be taken off the team's Total Score.

Teams, which missed the ESAC deadline by more than 7 days will be de-registered from the FSE 2015 competition.

In the event that the FSG Technical Committee requests additional information or calculations, teams have **7 days** from the date of the request to submit the requested information. Late submissions will be penalized with -5 (five) points per each commenced day, up to a maximum of -35 points, which will be taken off the team's Total Score.

2.7 Engineering Design Report and Design Spec Sheet

June 5th, 2015, 1200 CEST

The FSE Engineering Design Report must be uploaded to the 'My Team' area and the FSE Engineering Design Spec Sheet must be filled out online in the 'My Team' area on the FSG website no later than June 5th, 2015, **1200 CEST**.

The FSE Engineering Design Spec Sheet Form can be found on the FSG website in the 'My Team' area prior the deadline. Late submissions will be penalized with -10 (minus ten) points per each commenced day, up to a maximum of -100 points, which will be deducted from the team's Engineering Design Event Score. No report submitted will result in a score of zero for the Engineering Design Event.

2.8 Cost Report

June 5th, 2015, 1200 CEST

The Cost Report consists of two parts, a written report and an electronic report. The electronic Cost Report must be uploaded to the 'My Team' Area on the FSG Website no later than June 5th, 2015, 1200 CEST.

Late submissions will be penalized with -10 (minus ten) points per each commenced day, up to a maximum of -80 points, which will be deducted from the team's Cost Event Score. No report submitted will result in a score of zero for the Cost Event.

2.8.1 Electronic Copy

The electronic copy has to be the full report. This includes the full vehicle BOM, all parts & assemblies and supporting documentation.

The cost calculations have to be done with help of the Cost Tables.

The upload of the cost report has be done in the following three steps below. Only with all three of the steps accomplished the submission of the cost report is complete.

1. **upload of the cost tables as a Microsoft Excel® file (.xlsx)**
   For the electronic copy you are only allowed to use as many tabs with the exact name as given in the FSG_Master_eBOM. The FSG Master eBOM is available on the FSG Website in the section Rules & Important Documents (Specific FSG change of Formula SAE® 2015 Rule S4). The FSG Master eBOM includes the following tabs and naming: "Cost Summary", "BOM", "Brake System", "Engine & Drivetrain", "Frame & Body", "Instruments & Wiring", "Miscellaneous, Fit & Finish", "Steering System", "Suspension and Shocks", "Wheels & Tires", "Revision Log". Every needed assemblies and parts from each section have to be within the specified section. For other data use the Supporting Material file.

2. **upload of the supporting material as one separate .pdf file**
   The Supporting Material consists of drawings, exploded view drawing and/or pictures of your vehicle which allows the Judges to understand your BOM.
3. **enter the cost summary in a given template on the FSG website**
   If the cost summary BOM and the electronic BOM of your Excel-File will not match in total or in one section sum (5 USD tolerance for rounding) the higher price will be used and the team will be penalized with -10 (minus ten) points. This penalty points will be deducted from the Cost Event Score.

2.8.2 Written Copy

The written copy has to be the full report, like the electronic copy. The written copy has to be presented during the judging of the cost event. In case of differences between the written copy and the electronic copy, which are not covered by addenda per FSAE Rule S4.17, the electronic copy will be judged.

2.8.3 Add Item Requests

AIRs to be considered for the Cost Event 2015 have to be submitted no later than June 5th, 2015, 1200 CEST.

2.8.4 Cost Addendum (Specific FSG change of Formula SAE® 2015 Rule S4.17.1)

An addendum that reflects any changes or corrections made after the submission of the Cost Report must be submitted via the electronic form on the FSG Website (My team area) not later than July 28th, 2015, 1200 CEST. It will not be accepted at any other time or place. No other format will be accepted. Changes or corrections made during Scrutineering must be registered on the Inspection Sheet and shown to the judges.

2.8.5 Cost calculation for special parts

All available data (Design Report, Design Spec Sheet, IAD etc.) of your vehicle have to match. The data and values used within official documents must reflect the data and values registered within Cost Report.

Example:

1) The weight of monocoques or other fiber material parts is binding as declared in the Design Report or Design Spec Sheet. If the weight of your vehicle monocoque is 12 kg, then the total amount of carbon fiber incl. resin has to sum up to 12kg in the material section of your monocoque.

2) If you have 4x10kW as permanent power output of your engines declared in the Design Report this value has to be reflected in the Cost Report.

2.9 Business Plan Executive Summary

June 5th, 2015, 1200 CEST

The Business Plan Executive Summary must be uploaded to the ‘My Team’ area on the FSG website no later than June 5th, 2015, **1200 CEST**.

Late submission or non-submission will be penalized at the discretion of the judges up to -5 (minus five) points. These penalty points will be deducted from the Presentation Judging Score.

2.10 Charging Connector and max. Power

April 24th, 2015, 1200 CEST

Teams must inform FSG what the used charging connector is and what the maximum used charging power is no later than April 24th, 2015, 1200 CEST. The charging connector and max power can be chosen after registration in the 'My Team' area.

2.11 Electrical System Officer(s) Qualification Upload

June 19th, 2015, 1200 CEST

Several steps have to be completed to be accepted as a qualified ESO for the event.

1) Each team member that wants to be accepted as ESO must upload a document describing his/her qualification in the 'My Account' area on the FSG Website. This should be done in the form of an Adobe Acrobat® file (*.pdf).
2) The team captains are able to designate this team member as an ESO at the event in the 'My Team' area after the upload of the qualification document, see 2.12.
3) After the team member has been designated as an ESO at the event his/her qualification document will be reviewed by FSG officials.
4) If the qualification was determined to be sufficient for being an ESO, the team member will be approved to be an ESO at the event.

2.12 Team Member Designation

June 19th, 2015, 1200 CEST

Participating team members must be designated prior to the event. Additionally team members who should be an ESO during the event must be designated as such. To designate a team member, please visit the 'My Team' area on the FSG Website.

Team members can only be designated as FSE participants if they have entered the following personal information in their user profiles:

- Personal Address (required for insurance purposes)
- ZIP code (required for insurance purposes)
- City (required for insurance purposes)
- Clothing size (required for Event T-Shirts)
- Emergency contact person (parents e.g.)
- Emergency contact phone (parents e.g.)
- FISITA organisation you belong to
- FISITA organisation member number
- JPG Copy of their Health Insurance Certificate or copy of insurance confirmation letter (not older than one year)
- Name of the Health Insurance Company
- Health Insurance Certificate period of validity
- Current Target Degree of Study

In case the health insurance data of one or more team members is missing or incorrect, FSG will decline the designation of the team member(s) in question. Only designation of team members with complete and correct health insurance information will be accepted.

Team members that were declined can be registered again after their health insurance data has been corrected for an additional processing fee of 50 Euro.

2.13 Scrutineering Quiz

May 8th, 2015, 1200 CEST

Participating teams have to complete the Scrutineering Quiz. The Scrutineering order at the event will be based on the time a team needs to complete the quiz. The fastest team will receive the first slot, the slowest team will receive the last slot.

Teams that do not participate in the quiz will be sorted by registration order and will be placed at the very end of the Scrutineering queue behind the slowest team to complete the quiz. The Quiz will include questions about the 2015 Rules (FSAE2015 and FSE2015 rules) and the 2015 FSG Event Handbook.

FSG has the right to reorder the Scrutineering queue, in case the Scrutineering slot of a team coincides with a time slot of the team for a static event.

2.14 Vehicle Status Video and Vehicle Status Report

July 3rd, 2015, 1200 CEST

All teams must upload a video showing the car running under his own power prior the competition.

The Vehicle Status Video and Vehicle Status Report must be uploaded to the 'My Team' area on the FSG website no later than July 3rd, 2015, **1200 CEST**.

The video must be between 15 seconds and 30 seconds long, showing the car from a 3rd person view. During the video the car must be viewable in side view and must run under own power. This must be demonstrated by at least showing a situation in which the car is accelerating from standing still.

Running the car with bodywork is not necessary, but strongly recommended. The driver must wear protection gear as required in the rules and the tractive system active light and the ready-to-drive-sound must be working in a rules compliant way, see rule 3.10.

Teams which are not able to upload a video of the running car must hand in a Vehicle Status Report. This report must include:

- Written status of the car
- Photos of the car in the current assembly status
- List of all major components of the car, status of the components and photos of the components
- Reason for delay and project plan to finish the car prior the competition

FSG organizers will check each of the Vehicle Status Videos and Vehicle Status Reports.

Teams which hand in a Vehicle Status Report must answer all questions from the organizers within 48 hours. Teams, which missed the Vehicle Status Video / Vehicle Status Report deadline will be deregistered from the FSG 2015 competition. Missing the 48 hour deadline for answering questions of the organizers is comparable to non submission.

However, the upload of a Vehicle Status Report does only delay the necessity of a Vehicle Status Video. If a team does not upload a valid Vehicle Status Video until **July 15th, 2015, 1200 CEST**, it will be de-registered from the FSG2015 competition and will be replaced by the next team on the waiting list that uploaded a valid Vehicle Status Video.

A non-conforming Vehicle Status Report or a vehicle status which seems very unlikely to result in a driving vehicle at FSG2015 can lead to the de-registration of the respective team from the FSG2015 competition.

Video File format: mp4 / h.264, in a .zip folder / min 576i, max 1080p / max file size 20MB

Report File format: pdf / max. file size 5MB

3 General

3.1 FSE 2015 Rules

The Formula Student Electric (FSE) competition will comply with the Formula SAE® 2015 rules.

The Formula Student Electric Rules include some specific rule changes and additions.

Those changes and additions are located within this document, which supersedes the specific sections of the published Formula SAE® rules for 2015.

Additionally, all guidelines and clarifications which are posted in the 'FSE Rules&Important Documents'-section on the FSG website, http://www.formulastudent.de/fse/2015/rules/ , are also valid for each team competing at FSE2015.

3.2 Rules Questions

Any questions or ambiguities concerning the rules for Formula Student Electric will be resolved by the Formula Student Electric Rules Committee.

Rules questions are being answered via the online rules submission system via your 'My Team'-Area on the FSG website.

Make sure to check the FAQ thoroughly before asking rules questions which have already been answered.

Do not ask about more than one rule per submission.

Do not use the upload function to upload PDFs containing the text of the rules question. The upload function is intended to be used only for supporting information like sketches, CAD renderings, data sheets etc.

3.3 Official Language

The Formula Student Germany Official Language is **English only**.

3.4 Official time

The Formula Student Germany official time:

From	Till	Time
26.10.14	28.03.15	CET
29.03.15	24.10.15	CEST

To convert CET or CEST to your local time you may use following website:

http://www.timeanddate.com/worldclock/converter.html

3.5 FSE Registration

3.5.1 Registration deadline

The registration deadline for Formula Student Electric is listed in the Important Dates section of this document.

3.5.2 Registration Capacity Limit

Registrations will be given out, in the order in which they are received. The 2015 Formula Student Electric competition will be limited to 40 teams.

3.5.3 FSE Early Registration for Formula Student Germany Top6 Overall Finishers

6 registration slots will be available for the FSE 2014 Top6 overall finishers.

Place	Team
1	Zürich ETH
2	Stuttgart U
3	Delft TU
4	München UAS
5	Eindhoven TU
6	Osnabrück UAS

3.5.4 FSE Early Registration for International Teams

4 registration slots will be available for teams from outside of Europe.

Europe is defined to consist of the following countries: Albania, Andorra, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Moldova, Monaco, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, Vatican City State.

3.5.5 Registration Fee

The registration fee of 750 Euros is for a 20-person team. More team members can be registered for 20 Euros per additional team member. There is no limit to team size.

The registration fee must be paid on-line by PayPal within 72 hours of registration. Registration fees may not be paid by any other means. Registration fees are not refundable for any reason. There is no late registration and there are no exceptions to this registration policy.

3.5.6 FSG Registration Required Contact Information

Once the team has officially been registered for FSE, each team member and faculty advisor is required to add his/her identifying information online. All participants must provide their name and individual emergency contact information.

Participants may only be added (registered) by the team's official contact person (the person who registered the team for the event) until June 19th, 2015, **1200 CEST**.

3.5.7 Independent teams

In case a university takes part in FSG2015 with two cars, one in FSC and one in FSE, then these teams may not share team members or faculty advisors at the event. This means that no team member can be part of both teams, work on both cars or take part in any static or dynamic event for both teams.

3.6 Society Membership

Every participating team member must be a member of one of the FISITA (www.fisita.org) engineering societies.

3.7 Student Status

Students seeking a PhD degree/PhD Students or equal are not allowed to participate at FSG.

3.8 Faculty Advisor

FSG recommends that all participating teams have a Faculty Advisor present with them at the competition. In the event that no Faculty Advisor is present during the competition, the Team Captain will take over all responsibilities of the Faculty Advisor.
Any Faculty Advisor being registered as such must be a valid member of the faculty he/she is representing and can not be a student.

3.9 Event Handbook

The event handbook may contain special event procedures and restrictions for example regarding working on the car etc. It has to be read and understood by all event participants.

3.10 Testing and Work Safety

All teams are advised to always follow common practices and common sense when working on the vehicle and when operating the vehicle, also before and after the event. Participating in events not suitable for Formula Student vehicles like hillclimbs, drag races or similar wheel-to-wheel events is prohibited.
The following requirements listed are considered to be met at minimum to qualify as safe testing/running. NOTE: This does not mean that following these guidelines guarantees safety under all circumstances. It only means that FSG will not take further action with respect to any penalties:

- Driver wearing full protection gear incl. arm restraints
- Working TSAL, IMD, BMS/AMS, Torque Encoder plausibility check, torque/brake encoder plausibility check and brake system plausibility device
- Rules compliant frame/monocoque
- Mounted impact attenuator
- No wheel to wheel racing
- No other passenger cars, trucks etc. being driven on the same premise at the same time unless the area is clearly separated
- No running under low visibility conditions
- No running at speeds above typical event speeds, see Part D of the FSAE rules for details
- 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 roll hoop for example.

Breaching this rule will lead to the team being moved to the end of the Scrutineering order no matter which place they originally reached in the Scrutineering quiz, see 2.13.
The decision to move a team to the end of the Scrutineering order has to be made unanimously by the FSG rules committee and will be made public on the FSG website.
NOTE: This rule has not been established to annoy you, but to ensure that we experience a safe and accident free Formula Student season.

4 Vehicle Requirements and Restrictions

4.1 Alternative Frame Rules

Alternative Frame Rules are allowed for FSE 2015. Teams must submit their request by December 31st 2014 to following Email address AF-Rules@Formulastudent.de . Teams must follow the Formula SAE® AF Rules.

4.2 Drivers Cell (Specific clarification of Formula SAE® 2014 Rule T 3.5.5)

Formula SAE® 2014 Rule T3.5.5 is valid for the primary structure (defined in Formula SAE® 2014 Rule 3.3) in general, as long as the drivers cell is constructed following the Minimum Material Requirements (defined in Formula SAE® 2014 Rule T3.4) rules or the Alternative Tubing and Material rules (defined in Formula SAE® 2014 Rule T3.5).

4.3 Impact Attenuator

4.3.1 Impact Attenuator Design (Specific FSG change of Formula SAE® 2014 Rule T3.21.2)

Additional to the Formula SAE® 2014 Rule T3.21.1 requirements Impact Attenuators must have a closed front section.

4.3.2 Impact Attenuator Testing (Specific FSG change of Formula SAE® 2014 Rule T3.22.2)

Quasi-static testing is not allowed. Only dynamic tests (drop down, sledge or pendulum test) are allowed.

4.4 Driver Egress (Specific FSG change of Formula SAE® 2014 Rule T4.8)

The driver egress, required by Formula SAE® 2014 Rule T4.8 must be possible in all steering wheel positions.

4.5 Vehicle Identification

4.5.1 School Name (Specific FSG addition to Formula SAE® 2014 Rule T13.2)

Following school type abbreviations are accepted. The city name must be written fully.

Technical University - TU + City
University of Applied Sciences – UAS + City
University - Uni + City
Berufsakademie - BA + City

If the university uses a shortcut in their proper name, this shortcut is acceptable + city.

Example:
real name: Rheinisch-Westfälische Technische Hochschule Aachen -
proper name: RWTH Aachen

real name: Oregon State University Corvallis
proper name: OSU Corvallis

real name: Rochester Institute of Technology
proper name: Rochester IT

4.5.2 Technical Inspection Sticker Space (Specific FSG change of Formula SAE® 2014 T13.4)

The technical inspection sticker will be placed on the nose of the car directly in front of the cockpit opening. A space 75 mm tall x 150 mm wide (3” tall x 6” wide) must be made available for this sticker.

4.5.3 Transponders (Specific FSG change of Formula SAE® 2014 T12.2 and T12.3)

Transponders will be provided by FSG. Only provided transponders will be accepted. The allowed mounting position and orientation will be published in the event handbook.

4.6 Driver’s Underclothing (Specific FSG change of Formula SAE® 2014 Rule T14.6)

All drivers have to wear underwear (long pants and long sleeve t-shirt) certified to SFI 3.3 or FIA 8856-2000

4.7 Chassis

The used chassis has to comply to the FSAE2015 rules. An old chassis design, which was not entered in an FSE event before, may be used only if it complies to the FSAE2015 rules. In this case the chassis has to be rebuild.
The requirements for the IAD and the Anti-Intrusion Plate are not affected by using an old chassis. Therefore both have to comply to the FSAE Rules 2015 and the FSG/FSE additions.

4.8 Steering System (Specific FSG change of Formula SAE® 2014 Rule T6.5.8)

Steering systems using cables or belts for actuation are prohibited.

4.9 Second Year Vehicles

Vehicles that have competed during any previous “Formula SAE Year” are excluded from participating in Formula Student Germany Electric.

5 Pit Rules

5.1 Electrical Power during pushing

It must be possible to push the car around with all electrical systems deactivated.

5.2 Activating the tractive system

The Event Handbook will define where and under which conditions the tractive system may be activated.

5.3 Quick Jack

Each team must present a quick jack to lift up the car by using the jacking point during Technical Inspection.
The quick jack must be able to lift up the car, so that the driven wheels are at least 10.2 cm (4 in) off the ground.

5.4 Tire and Rim Combination

During Scrutineering each team needs to present a tires for dry condition and tires for wet conditions. All dry tires have to have the same manufacturer, size and compound as all other sets.

All wet tires have to have the same manufacturer, size and compound as all other sets.

Running different tire sizes, manufacturer and compounds for each wheel in a set is acceptable.

The tire type/rim type combination presented during Scrutineering must be the same during the whole event. The rims for dry tires and wet tires can be different.

6 SEF and IAD Documents

6.1 Structural Equivalency and Structural Equivalency Spreadsheet

All teams must submit a Structural Equivalency Spreadsheet. A blank copy of this form is supplied on the Formula Student Germany Website

http://www.formulastudent.de/fse/2015/rules/

The use of alternative materials or tubing sizes to those specified in Formula SAE® 2015 Rule T3.4.1 “Baseline Steel Material” is allowed, provided they have been judged by a technical review to have equal or superior properties to those specified in Formula SAE® 2015 Rule T3.4.1 “Baseline Steel Material”.

6.2 Impact Attenuator Data

All teams must submit the FSG Impact Attenuator Data Form, along their test results, description of the test setup, the used test equipment and photo documentation of the IAD before and after the test. The Impact Attenuator Data must be submitted no later than the specified date.

A blank copy of this form is supplied on the Formula Student Germany Website
http://www.formulastudent.de/fse/2015/rules/

7 Electrical Rules

7.1 Energy Meter LV Supply

The Energy Meter must be directly supplied from the GLV master switch.

7.2 Clarification on Accumulator Monitoring Systems (Specific FSE addition to Formula SAE® 2015 Rule EV3.6)

The AMS must keep the accumulator cells within their safe operation limits with respect to charge and discharge currents according to the manufacturers data sheet.
Failure to obey the given limits may result in a penalty ranging from point deductions up to disqualification.

7.3 Clarification on Accumulator Monitoring Systems (Specific FSE addition to Formula SAE® 2015 Rule EV3.6)

The AMS must be able to read and display all cell voltages e.g. by connecting a laptop to the AMS. This must be demonstrated during E-Scrutineering.

7.4 Specific FSE change of Formula SAE® 2015 Rule EV2.2.4

FSE will not punish 100ms-continuity violations.

7.5 Interlocks (specific FSE change of Formula SAE® 2015 Rule EV3.3.6)

An interlock / pilot signal is always needed for EVERY tractive system connection unless the connection is made within a housing.

Note: Housings only used to avoid interlocks will be considered bad engineering practice.

7.6 Clarification on Galvanic Separation in Accumulator Containers (Formula SAE® 2015 Rule EV4.1.4)

The mentioning of galvanic separation in this rule is redundant to rule EV1.2.7 and should only encourage teams to check for compliance to EV1.2.7. Therefore no extra galvanic separation is needed.

7.7 Clarification on Galvanic Separation in Accumulator Containers (Formula SAE® 2015 Rule EV5.2.4)

The sentence “Interlocks between the TSMS and AIR’s must not be in the low (ground) connection to the AIR coils.” can be ignored as it is not consistent with other requirements contained in this rule.

7.8 Device to be used for checking compliance to FSAE2015 EV3.6.3

FSG is currently investigating different means of independent cell temperature monitoring during the dynamic events. The respective device and further data/requirements will be published as soon as possible.

7.9 Specific FSE change of Formula SAE® 2015 Rule EV3.7.4

EV3.7.4 Battery packs based on Lithium Chemistry must be separated from the driver with a firewall.

8 Technical Inspection

8.1 Inspection & Testing Requirement

The Technical Inspection will be divided in an electrical inspection and a mechanical inspection.
The electrical inspection will declare the car as electrically safe and must be the first inspection. Before passing E-Scrutineering the car may only be moved around on the event site, if both detachable keys of the Master Switches have been removed and are kept safe by an Electrical System Officer.

Scrutineers will mark or seal various different approved parts (i.e. insulation monitoring device, accumulator containers, energy meter, tires, rims etc.). The car can be disqualified from any dynamic event by using unmarked parts or substituting marked parts. Parts with broken seals are equivalent to being unmarked.
Broken seals can only be replaced by a scrutineer.

After passing E-Scrutineering the car can be presented for the normal mechanical scrutineering.

The Scrutineering Inspection sheet will be made available on the FSG website at http://www.formulastudent.de/fse/2015/rules/

8.2 Equipment

For the electric part of the technical inspection each team must present the following equipment:

- accumulator charger to be used during the event
- all accumulator containers to be used during the event
- data sheets for all used parts in the tractive system
- Copy of the ESF
- Copy of the FMEA
- Accumulator Container Hand Cart
- Tools as listed in Formula SAE® 2015 Rule EV8.5

8.3 Car weighing

All cars will be weighed prior to Engineering Design Judging. All cars are to be weighed in ready to race condition. All fluids and coolant must be in the car. This weight will be the car's Official Technical Inspection weight. There will be a penalty if the car weight changes during Dynamic Competition. The allowable weight tolerance is ± 5.0 kg. In the case of overweight or underweight in comparison to the Technical Inspection weight, the team will be penalized -20 (twenty) points for each kg (or portion of a kg) of additional or missing weight. This point penalty will be deducted from the Engineering Design Event score. (Each 0.1 to 1.0 kg = -20 points)
Example:
If the car is 5.3 kg underweight: 5.3 kg minus the 5.0 kg tolerance = 0.3 kg equals -20 Points
If the car is 7.8 kg overweight: 7.8 kg minus the 5.0 kg tolerance = 2.8 kg equals -60 Points
If the car weight changes due to replacement of broken parts, the car must be presented for tech inspection and then re-weighed. It is the team's responsibility to have the car re-weighed before entering a dynamic event after changing parts.

8.4 Inspection Holes

To allow the verification of tubing wall thickness, 4.5 mm (0.18 inch) inspection holes must be drilled in a non-critical location of both the Main Hoop and the Front Hoop. In addition, the Technical Inspectors may check the compliance of other tubes that have minimum dimensions specified. This may be done by the use of ultra sonic testing or by the drilling of additional inspection holes at the inspector's request. Inspection holes must be located so that the outside diameter can be measured ACROSS the inspection hole with a vernier caliper, i.e. there must be access for the vernier caliper to the inspection hole and to the outside of the tube one hundred eighty degrees (180°) from the inspection hole.

9 Static Events

9.1 Business Logic Case (Specific FSG change of Formula SAE® 2015 Rule S3)

The Business Logic Case is not part of the FSG event - submitting is not needed.

9.2 Business Plan Presentation (75 Points)

9.2.1 Executive Summary

Judging will start with an Executive Summary before the FSG Competition. The principal document submitted prior to the Business Plan Presentation is an Executive Summary. The Executive Summary must not exceed one (1) page, team name and car number must be written on the Executive Summary. The Executive Summary should contain a brief description of the team's Business Plan. In the Summary the two most outstanding technical features and the anticipated production costs of the car have to be listed.
The Executive Summary must relate to the specific prototype car entered in the FSG competition.
Even though the Executive Summary is only judged by the presentation judges, all Engineering Design and Cost judges will have access to the file and may refer to it.

The Executive Summary must be submitted in Adobe Acrobat® format (*.pdf file) online, no later than the specified date.

Penalties:
Up to five (5) penalty points will be deducted from your final Business Plan Presentation Score.

Late submission: up to -2 point
Team name and/or Car number missing: -1 point
Two (2) technical highlights missing: -1 point
Vehicle costs missing: -1 point

Note1: Consider your Executive Summary to be the first impression of your Business Plan to the Executive Board of a major auto manufacturing company

9.2.2 Deep dive topic

After submission of the Executive Summary the teams will receive a specific Deep Dive Topic from the presentation judges prior the competition. The task will be sent via email to the team's responsible person's email address.

Every team has to present this special Deep Dive Topic as a part of the team's business plan presentation to the judges.

NOTE: A team should not describe only this Deep Dive Topic in the business plan presentation. It's important that a team presents a good business plan as well.

9.2.3 Data Projection Equipment

Video Projectors will be provided by Formula Student Electric. These Projectors will have VGA Input Connectors.

The organizers will not provide any other presentation equipment needed. Teams planning to use other presentation equipment, as a part of their presentation, are responsible for bringing, or otherwise arranging for their own equipment.

9.2.4 Judging Sequence

At Formula Student Germany the Business Plan Presentation Judging will consist of two parts:

I. Initial judging of all teams
II. Final judging ranking the top 3-5 teams

9.2.5 Scoring Formula

The scoring of the event is based on the average of the two or three presentation judging forms. There is a maximum of seventy-five (75) points from the FSG Presentation Judging Form.

Non finalist:

PRESENTATION SCORE = 70 x (Pyour/Pmax)
Where:
“Pmax``” is the highest score awarded to any team not participating in the finals
“Pyour” is the score awarded to your team

Finalists:

1st Place 75 points
2nd Place 74 points
3rd Place 73 points
4th Place 72 points
5th Place 71 points

It is intended that the scores will range from near zero (0) to seventy-five (75) to provide good separation. The Presentation Event Captain may at his/her discretion; normalize the scores of different judging teams.

9.3 Engineering Design Event (150 Points)

9.3.1 Judging Sequence

At Formula Student Germany Engineering Design Judging will consist of two parts:

I. Initial judging of all vehicles
II. Final judging ranking

9.3.2 Engineering Design Report Files File Format and Size

The FSE Engineering Design Report must be submitted in Adobe Acrobat® format (*.pdf file) online, no later than the specified date. The size of the document must not exceed 5MB. A responsibly sized document will be much smaller than 5MB in file size. Please ensure that photos within the Acrobat file are of an appropriate resolution.

9.3.3 Engineering Design Spec Sheet File Format and Units

The FSE Engineering Design Spec Sheet must be filled out online, no later than the specified date. The Formula Student Electric Engineering Design Spec Sheet Form can be found on the FSG website in the 'My Team' area prior the deadline.

The form is for metric units only.

9.3.4 Penalty for late submission

Penalties for late/non submission of the Engineering Design Reports and/or Engineering Design Spec Sheets is as follows:

Late arrival of one or both documents: -10 (ten) points for each day, up to a maximum penalty of -100 points.

Failure to submit one or both documents will automatically result in zero points for the Engineering Design Event.

The penalty points will be deducted from your final Engineering Design Scores. The minimum allowable Engineering Design Score will be 0 Points.

9.4 Cost Event (100 Points)

9.4.1 Cost Event Scoring (Specific FSG change of Formula SAE® 2015 Rule S4.8)

The points for the Cost and Manufacturing Event will be broken down as follows

$$\left(20 * \frac{\left(\frac{P_{max}}{P_{your}} - 1\right)}{\left(\frac{P_{max}}{P_{min}} - 1\right)}\right) * \frac{P_{your(Visual\_Inspection)}}{40}$$

	20 Points	20 Points lowest cost - each of the participating schools will be ranked by total retail cost from the BOM multiplied with a quotient of $P_{your\ (visual\ inspection)}$ and 40 (maximum points for visual inspection) and given 0-20 points based on the formula on the left. P_{your} is the cost of your car and P_{min} is the cost of the cheapest car. P_{max} is the cost of the most expensive car. $P_{your\ (visual\ inspection)}$ are your points for the visual inspection.40 points are the maximum score for visual inspection
	40 Points	Real Case Situation – Teams will receive a task covered a “Real Case in Industry”
	40 Points	Event Day/Visual Inspection - The cars will be reviewed for part content and manufacturing feasibility. The submitted process descriptions will be discussed.
Total	**100 Points**	

9.4.2 Late submission of Cost Report (Specific FSG change of Formula SAE® 2015 Rule S4.16)

Teams that submit reports later than the specified date will be penalized -10 (ten) points per day, up to a maximum penalty of -80 points. Teams that do not submit a Cost Report will

receive 0 (zero) points for the Cost & Manufacturing Analysis score. Minimum Event score is 0 (zero) points.

9.4.3 Addenda (Specific FSG change of Formula SAE® 2015 Rule S4.17)

For changes in your corrections made after the submission of the cost report please use the FSAE cost addendum form given in the FSAE Rules Appendix S-5. For all new parts, which are manufactured, a drawing must be attached to the addendum form.
The addendum incl. all drawings must be uploaded to the 'My Team' Area on the FSG Website no later than July 28th, 2015, 1200 CEST (Adobe Acrobat® format (*.pdf file)).

9.4.4 Cost Report Penalties Process (Specific FSG/FSE change of Formula SAE® 2015 Rule S4.18)

Only penalty method A will be used for FSE, described in Rule S4.19 "Penalty Method A-Fixed Point Deductions" of the Formula SAE® 2015 Rules. The Formula SAE® 2015 Rule S4.20 "Penalty Method B – Adjusted Cost Deductions" is not valid for the FSG competition.

10 Dynamic Events

10.1 Dynamic Events and Maximum score (Specific FSG change of Formula SAE® 2015 Part D Article 1)

Skid Pad	75
Acceleration	75
Autocross	100
Efficiency	100
Endurance	325
Total	**675**

10.2 Skid Pad Scoring (Specific FSG change of Formula SAE® 2015 D6.8.3)

The following equation is used to determine the scores for the skid-pad event:

$$SkidPadScore = 71.5x\frac{\left(\left(\frac{T_{\max}}{T_{your}}\right)^2 - 1\right)}{\left(\left(\frac{T_{\max}}{T_{\min}}\right)^2 - 1\right)} + 3.5$$

Where:
T_{your} is the average of the left and the right timed laps on your best run including penalties.
T_{min} is the lowest corrected elapsed time recorded for any competitor in either heat.
T_{max} is 125% of **T_{min}.**

Teams exceeding **T_{max}** will receive 3.5 points.

10.3 Autocross Scoring (Specific FSG change of Formula SAE® 2015 D7.8.1)

The following equation is used to determine the scores for the autocross event:

$$AutocrossScore = 95.5x\frac{\left(\frac{T_{\max}}{T_{your}} - 1\right)}{\left(\frac{T_{\max}}{T_{\min}} - 1\right)} + 4.5$$

Where:
T_{min} is the lowest corrected elapsed time recorded for any competitor in either heat.
T_{max} is 125% of **T_{min}.**
T_{your} is the lowest corrected elapsed time in either heat for the team being scored.

Teams exceeding **T_{max}** will receive 4.5 points.

10.4 Endurance Scoring (Specific FSG change of Formula SAE® 2015 D8.20.2)

The following equation is used to determine the scores for the endurance event:

$$EnduranceScore = 300x\frac{\left(\frac{T_{\max}}{T_{your}} - 1\right)}{\left(\frac{T_{\max}}{T_{\min}} - 1\right)} + 25$$

Where:
T_{min} will be the lowest corrected time of the fastest team of the event.
T_{your} will be the combined corrected times of both of your team's drivers in the heat.
T_{max} will be 1.333 times **T_{min}**.
Teams exceeding **T_{max}** will receive 25 points.

10.5 Efficiency Scoring (Specific FSE change of Formula SAE® 2015 D8.23.3, D8.23.4, D8.23.5 and D8.23.6)

The following equation is used to determine the scores for the Efficiency event

$$EfficiencyScore = 100x\frac{\left(\frac{EfficiencyFactor_{\min}}{EfficiencyFactor_{your}} - 1\right)}{\left(\frac{EfficiencyFactor_{\min}}{EfficiencyFactor_{\max}} - 1\right)}$$

$$EfficiencyFactor = \left(\frac{T_{\min/Lap}}{T_{yours/Lap}}\right)x\left(\frac{E_{\min/Lap}}{E_{yours/Lap}}\right)^2$$

Where:
$T_{min/Lap}$ will be the lowest corrected Endurance time **per completed lap** of the fastest team of the event.
$T_{yours/Lap}$ will be the corrected Endurance time **per completed lap** of the team being scored.
Vehicles whose corrected time exceeds 1.333 times the corrected time of the fastest team, will receive zero (0) points for Efficiency.

$E_{min/Lap}$ is the lowest consumed Endurance energy **per completed lap** by any competitor.
$E_{yours/Lap}$ is the consumed Endurance energy **per completed lap** of the team being scored.

The consumed Endurance energy is calculated as the time integrated value of the measured voltage multiplied by the measured current logged by the energy meter. Regenerated energy will be multiplied with 0.9 and subtracted from the used energy, as long as the fed back currents remain within the maximum values given in the cell data sheet.

$EfficiencyFactor_{min}$ is fixed at 0.1 to suppress the influence of the worst competitor on the scaling of scores.

$EfficiencyFactor_{max}$ is the maximum EfficiencyFactor reached by any team.

Before the endurance event, every energy meter memory storage may be cleared by an official. The energy meter data is read out when the car is in Parce Fermé.

11 Changelog

V1.2.0:
Deleted 2.6 FMEA
Added 2.6 ESAC
Changed 2.8 Cost Report
Added 7.9

V1.1.0:
Changed 2.13: date changed to 8th May 2015

Added 9.1

Changed 10.5: EfficiencyFactormin is fixed at 0.1 to suppress the influence of the worst competitor on the scaling of the scores.

V1.0.0:
Initial release