



Formula Student Combustion Rules 2015

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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 Combustion 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 FSC

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 75 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 30 teams have registered, whichever occurs first.

If all Early Registration Slots are full for one region, additional teams from the same region can register when Official Registration opens on January 19th, 2015. 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/fsc/2015/rules/>

Additionally all teams must submit a 3 dimensional model of the frame / monocoque in "IGES" file format.

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 -50 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/fsc/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 Engineering Design Report and Design Spec Sheet

June 5th, 2015, 1200 CEST

The FSC Engineering Design Report must be uploaded to the 'My Team' area and the FSC 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 FSC 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.

2.6 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.

2.6.1 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 to 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.

2.6.2 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.

2.6.3 Add Item Requests

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

2.6.4 Cost Addendum

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.

2.6.5 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:

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 12kg, then the total amount of carbon fiber incl. resin has to sum up to 12kg in the material section of your monocoque.



2.7 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.

Note: The Business Plan Executive Summary is not a Business Logic Case!

2.8 Fuel Type Order

June 19th, 2015 at 1200 CEST

You must inform FSG which type of fuel you will use no later than June 19th, 2015, 1200 CEST.

2.9 ETC FMEA Upload and Notice of Intent

March 27th, 2015, 1200 CET

ETC FMEA Data must be uploaded to the 'My Team' area on the FSG website no later than March 27th, 2015, **1200 CET** . The ETC FMEA Data must be submitted in Adobe Acrobat® format (*.pdf file). The FMEA Template is the FSAE 2015 Electronic Throttle Control (ETC) Failure Modes and Effect Analysis Template and can be found on the FSAEonline.com Website. For FSC 2015 the Notice of Intent is part of the FMEA. The Template 2015 Electronic Throttle Control Notice of Intent can be found on the FSAEonline.com website.

2.10 Team Member Designation

June 19th, 2015 at 1200 CEST

Participating team members must be designated prior to the event. To designate a team member, please visit the "My team area" on the FSG Website.

Team members can only be designated as FSC 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.

2.11 Scrutineering Quiz

May 8th, 2015 at 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 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.

2.12 Vehicle Status Video and Vehicle Status Report

July 3rd, 2015 at 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.

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 72 hours. Teams, which missed the Vehicle Status Video / Vehicle Status Report deadline will be deregistered from the FSG 2015 competition. Missing the 72 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 / up to 1080p / max file size 20MB

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



3 General

3.1 FSC 2015 Rules

The Formula Student Combustion (FSC) competition will comply with the Formula SAE®2015 rules. The Formula Student Combustion 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 “FSC Rules&Important Documents”-section on the FSG website, <http://www.formulastudent.de/fsc/2015/rules/> , are also valid for each team competing at FSC2015.

3.2 Rules Questions

Any questions or ambiguities concerning the rules for Formula Student Combustion will be resolved by the Formula Student Combustion 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 FSC Registration

3.5.1 Registration deadline

The registration deadline for Formula Student Combustion 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 Combustion competition will be limited to 75 teams.

3.5.3 FSC Early Registration for Formula Student Germany Top10 Overall Finishers

10 registration slots will be available for the FSC 2014 Top10 overall finishers.

Place	Team
1	Oregon State University
2	University of Stuttgart
3	Chalmers University of Technology
4	University of Erlangen
5	Prague CTU
6	University of Washington
7	UAS Coburg
8	UAS Weingarten
9	California State Polytechnic University, Pomona
10	UAS Giessen

3.5.4 FSC Early Registration for TOP 10 World Ranking Teams

10 (ten) registration slots will be available for the World Ranking Top 10 (Ten) teams. The Top 10 ranking which is valid on the day when early registration starts will count. The World Ranking can be found here: <http://www.fs-world.org>

3.5.5 FSC Early Registration for International Teams

15 registration slots will be available for Overseas Teams and non-German, European teams before Official Registration starts. These 15 slots are split into 4 regions as follows:

Region (For Definition of Regions see Appendix A)	Number of Slots
Australasia, China and Japan	3
Europe (beside Germany)	4
North America	4
Rest of the world beside Europe	4

Definition of the regions can be found in the FSG Rules, Appendix A



3.5.6 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.

3.5.7 FSG Registration Required Contact Information

Once the team has officially been registered for FSG, 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 at 1200 CEST.

3.5.8 Independent teams

In case a university takes part in FSG 2015 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. The Faculty Advisor itself needs to be an employee of the university.

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 ETC plausibility checks and BSPD, if applicable



- 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 8.

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 FSC 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® 2015 Rule T 3.5.5)

Formula SAE® 2015 Rule T3.5.5 is valid for the primary structure (defined in Formula SAE® 2015 Rule 3.3) in general, as long as the drivers cell is constructed following the Minimum Material Requirements (defined in Formula SAE® 2015 Rule 3.4) rules or the Alternative Tubing and Material rules (defined in Formula SAE® 2015 Rule 3.5).

4.3 Impact Attenuator

4.3.1 Impact Attenuator Design (Specific FSG change of Formula SAE® 2015 Rule T3.21.1)

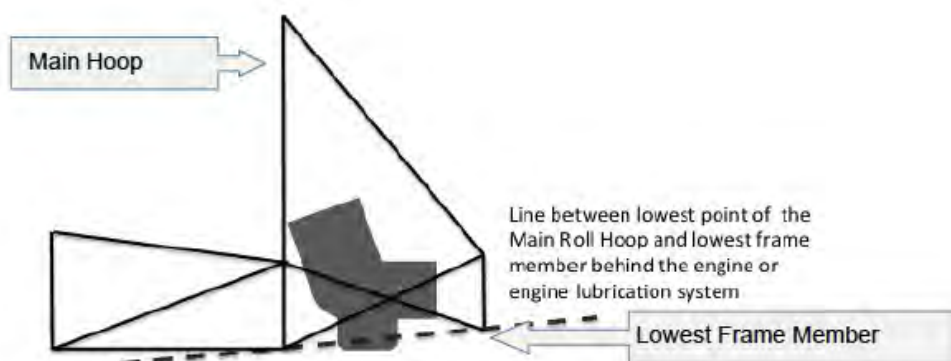
Additional to the Formula SAE® 2015 Rule T3.21.1 requirements Impact Attenuators must have a closed front section.

4.3.2 Impact Attenuator Testing (Specific FSG change of Formula SAE® 2015 Rule T3.22.2)

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

4.4 Engine Lubrication System

The lowest point of the engine lubrication system must be no lower as the line between the lowest point of the main roll hoop and the lowest frame rail behind the engine and/or lubrication system. If the engine oil sump or any other part of the lubrication system is lower than this line (figure 1), it must be protected by a sufficient skid plate, or frame tubes installed longitudinally under affected part of the engine lubrication system.



The engine lubrication system must be protected from surface contact in any situation while in operation on track, especially in the event of a suspension failure. The skid plate itself can not be mounted to parts of the engine

4.5 Driver Egress (Specific FSG change of Formula SAE® 2015 Rule T4.8)

The driver egress, required by Formula SAE® 2015 Rule T4.8 must be possible in all steering wheel positions.



4.6 Fuel System

4.6.1 Fuel Rails (Specific FSG change of Formula SAE® 2015 Rule IC1.9.)

The use of fuel rails made from plastic, carbon fibre or rapid prototyping flammable materials is prohibited. The use of OEM Fuel Rails is acceptable.

4.6.2 Fuel (Specific FSG change of Formula SAE® 2015 Rule IC 2.1)

The fuels provided at FSC 2015 are expected to be 98 octane (ROZ 98) gasoline and E-85. This is subject to change.

4.7 Steering System (Specific FSG change of Formula SAE® 2015 Rule T6.5.8)

Steering systems using cables or belts for actuation are prohibited.

4.8 Vehicle Identification

4.8.1 School Name (Specific FSG addition to Formula SAE® 2015 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

If the University is using a unique name, the team has the choice to use the shortcut of the unique name + city or the full written name.

Example:

real name: Rheinisch-Westfälische Technische Hochschule Aachen

proper name: RWTH Aachen or Rheinisch-Westfälische Technische Hochschule

real name: Oregon State University Corvallis

proper name: Oregon State University or OSU Corvallis

4.8.2 Technical Inspection Sticker Space (Specific FSG change of Formula SAE® 2015 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.

4.8.3 Transponders (Specific FSG change of Formula SAE® 2015 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.

4.9 Driver's Underclothing (Specific FSG change of Formula SAE® 2015 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

4.10 First Year Vehicles

Only first year vehicles may enter the Formula Student Germany Competition.



To be classified as a “first year vehicle” a car must, as a minimum, have a completely new frame or monocoque (whichever is applicable) . Photographic or other evidence will be used to determine if the frame or monocoque is new.

If there is any question about whether or not the car is in fact a first year vehicle, it will be the sole responsibility of the team to produce such evidence as the organizers or judges may require.

4.11 Second Year Vehicles

Vehicles that have competed during any previous “Formula SAE Year” as defined in 4.10 are prohibited from Formula Student Germany.

4.12 Electronic Throttle Control - ETC (Specific FSG change of Formula SAE® 2015 Rule IC1.11.3)

In case of using a not modified OEM Throttle Control System, a second spring is not necessary. The requirement is that the part is not modified in any way and is used as “provided by the manufacturer” status.

4.13 Battery Packs

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



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 Engine running in the pits

Running of engines is not allowed in the pits or the garage areas. There is a designated, supervised, engine running area for this purpose. All engine running is to be conducted in the designated engine running area only. Engine running is allowed only during the active hours of competition. No engines are to be run under any circumstances between the hours of 2000 to 0800

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/fsc/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/fsc/2015/rules/>



7 Technical Inspection

7.1 Inspection & Testing Requirement

Tech Inspectors will mark or seal various different approved parts (i.e. air restrictor, tires, rims etc.). The car can be disqualified from any dynamic event by using, or substituting unmarked parts. Parts with broken seals are equivalent to being unmarked.

7.2 Car weighing

All cars will be weighed prior to Engineering Design Judging. All cars are to be weighed in ready to race condition. The fuel tank must be filled to the fuel level line. All lubricants and coolants 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.

7.3 Inspection Holes

To allow the verification of tubing wall thicknesses, 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 such 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.



8 Static Events

8.1 Business Plan Presentation (75 Points)

8.1.1 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

Note 1: Consider your Executive Summary to be the first impression of your Business Plan to the Executive Board of a major auto manufacturing company.

Note 2: There will be no Business Logic Case at FSG.

8.1.2 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.

8.1.3 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.



8.1.4 Judging Sequence

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

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

8.1.5 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:

$$\text{PRESENTATION SCORE} = 70 \times (P_{\text{your}}/P_{\text{max}})$$

Where:

“P_{max}” is the highest score awarded to any team not participating in the finals

“P_{your}” is the score awarded to your team

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.

8.2 Engineering Design Event (150 Points)

8.2.1 Judging Sequence

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

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

8.2.2 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.

8.2.3 Engineering Design Spec Sheet File Format and Units

The FSC Engineering Design Spec Sheet must be filled out online, no later than the specified date. The Formula Student Combustion 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.

8.2.4 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.

8.3 Cost Event (100 Points)

8.3.1 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

$\left(20 * \frac{\left(\frac{P_{max}}{P_{your}} - 1 \right)}{\left(\frac{P_{max}}{P_{min}} - 1 \right)} \right) * \frac{P_{your(Visual_Inspection)}}{40}$	<p>20 Points</p> <p>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> <p>P_{your} is the cost of your car and P_{min} is the cost of the cheapest car.</p> <p>P_{max} is the cost of the most expensive car.</p> <p>$P_{your(visual\ inspection)}$ are your points for the visual inspection. 40 points are the maximum score for visual inspection</p>
<p>40 Points</p>	<p>Real Case Situation – Teams will receive a task covered a “Real Case in Industry”</p>
<p>40 Points</p>	<p>Event Day/Visual Inspection - The cars will be reviewed for part content and manufacturing feasibility. The submitted process descriptions will be discussed.</p>
<p>Total</p>	<p>100 Points</p>



8.3.2 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.

8.3.3 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 29th, 2015, 1200 CESTc.

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

Only penalty method A will be used for FSC, 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.



9 Dynamic Events

9.1 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

9.2 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.

9.3 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.

9.4 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.

9.5 Fuel Efficiency Scoring (Specific FSG change of Formula SAE® 2015 Rule D8.21, D8.23.3 and D8.23.4)

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

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

$$EfficiencyFactor = \left(\frac{T_{min/laptotal}}{T_{yours / lapyours}} \right) x \left(\frac{V_{min/laptotal}}{V_{yours / lapyours}} \right)$$

Where:

V_{min} is the smallest volume of fuel used by any competitor, who fulfils **T_{your} < 1.333 x T_{min}**

V_{your} is the volume of fuel used by the team being scored. Vehicles whose fuel volume exceeds 26 liter/100km, will receive zero (0) points for fuel efficiency.

T_{min} will be the lowest corrected time of the fastest team of the event, whose fuel volume will not exceeds 26 liter/100km.

T_{your} will be the combined corrected times of the drivers in your heat. Vehicles whose corrected time exceeds 1.333 times the corrected time of the fastest team, will receive zero (0) points for fuel efficiency.

Lap_{yours} will be the number of driven laps, at least 50% of the total endurance distance. The car must re-enter the track after the driver change.

Lap_{total} will be the number of laps of the full endurance distance.



10 Changelog

V1.0:

Initial release

V1.2

Change Dates in

- 2.2.1 Registration FSC
- 2.2.2 Early Registration
- 2.11 Scrutineering Quiz

add Rule

- 4.12 Electronic Throttle Control - ETC (Specific FSG change of Formula SAE® 2015 Rule IC1.11.3)

Change Rule

- 8.1.1 Executive Summary

V1.3

Changed Rules

- 2.6.1 Electronic Copy
- 2.6.4 Cost Addendum
- 2.9 ETC FMEA Upload and Notice of Intent

Added Rule

- 2.6.5 Cost calculation for special parts

V1.4

Added Rule

- 4.13 Battery Packs