# Formula Student Germany
# Rules 2016

Version 1.0.0
Release Date: 10. Dec. 2015

**1 Introduction 5**

**2 Important Dates 5**
2.1 Competition Dates and Place....5
2.2 Registration....5
2.2.1 Early Registration....5
2.2.2 Main Registration....5
2.3 Structural Equivalency Spreadsheet (SES)....5
2.3.1 Submission of SES + 3 dimensional CAD model....5
2.3.2 Submission of SES APPROVAL (only valid for monocoque cars)....6
2.4 Impact Attenuator Data (IAD)....6
2.5 [FSC only] Electronic Throttle Control (ETC) Notice of Intent and FMEA Upload....6
2.6 [FSE only] Electrical System Form (ESF)....7
2.6.1 ESF Add Item Request (EAIR)....7
2.6.2 Electrical System Form....7
2.7 Engineering Design Report and Design Spec Sheet....7
2.8 Cost Report....7
2.8.1 Electronic Copy....7
2.8.2 Written Copy....8
2.8.3 Add Item Requests....8
2.8.4 Cost Addendum....8
2.9 Business Plan Executive Summary....8
2.10 [FSC only] Fuel Type Order....8
2.11 [FSE only] Charging Connector and max. Power....8
2.12 [FSE only] Electrical System Officer(s) Qualification Upload....9
2.13 Team Member Designation....9
2.14 Scrutineering Quiz....9
2.15 Vehicle Status Video (VSV) and Vehicle Status Report (VSR)....10
2.15.1 Vehicle Status Video....10
2.15.2 Vehicle Status Report....10

**3 General 11**
3.1 FSG 2016 Rules....11
3.2 Rules Questions....11
3.3 Official Language....11
3.4 Official Time....11
3.5 FSG Registration....12
3.5.1 Registration deadline....12
3.5.2 Registration capacity limit....12
3.5.3 [FSE only] FSE Registration....12
3.5.4 [FSC only] FSC Registration....12
3.5.5 Registration Fee....13
3.5.6 FSG Registration Required Contact Information....13
3.5.7 Independent teams....13
3.6 Deadline and Penalties....14
3.6.1 General Aspects....14
3.6.2 Intentionally wrong submissions....14
3.6.3 De-registration....15

3.7 Society Membership....15
3.8 Student Status....15
3.9 Faculty Advisor....15
3.10 Event Handbook....15
3.11 Testing and Work Safety....15

**4 Vehicle Requirements and Restrictions 17**
4.1 Alternative Frame Rules....17
4.2 Drivers Cell....17
4.3 Impact Attenuator....17
4.3.1 Impact Attenuator Design....17
4.3.2 Impact Attenuator Testing....17
4.3.3 Anti Intrusion Plate (AIP) Testing....17
4.4 Driver Egress....17
4.5 Vehicle Identification....17
4.5.1 School Name....17
4.5.2 Technical Inspection Sticker Space....18
4.5.3 Transponders....18
4.6 Driver's Underclothing....18
4.7 Tire and Rim Combination....18
4.8 Tires....18
4.9 Steering System....19
4.10 Minimum Radii of edges....19
4.11 First Year Vehicles....19
4.12 Second Year Vehicles....19
4.13 Inspection Holes....19
4.14 External batteries....19
4.15 [FSC only] Engine Lubrication System....19
4.16 [FSC only] Fuel Rails....20
4.17 [FSC only] Electronic Throttle Control (ETC)....20
4.18 [FSE only] Energy Meter LV Supply....20
4.19 [FSE only] Clarification on Accumulator Monitoring Systems....20
4.20 [FSE only] 100ms-continuity violations....20
4.21 [FSE only] Interlocks....21
4.22 [FSE only] Galvanic Separation in Accumulator Containers....21
4.22.1 Clarification on FSAE 2016 Rule EV4.1.4....21
4.22.2 Clarification on FSAE 2016 Rule EV5.2.4....21
4.23 [FSE only] Device to be used for checking compliance to FSAE®2016 EV3.6.3....21
4.24 [FSE only] Specific FSG rule for attachment of HV-components....21

**5 Pit Rules 22**
5.1 Electrical Power during pushing....22
5.2 [FSE only] Activating the tractive system....22
5.3 [FSC only] Engine running in the pits....22
5.4 Quick Jack....22

**6 Technical Inspection 23**

6.1 Inspection & Testing Requirement....23
6.2 [FSE only] Equipment....23
6.3 Car weighing....23

**7 Static Events 24**
7.1 Business Logic Case....24
7.2 Business Plan Presentation (75 Points)....24
7.2.1 Executive Summary....24
7.2.2 Deep dive topic....24
7.2.3 Data Projection Equipment....24
7.2.4 Judging Sequence....25
7.2.5 Scoring Formula....25
7.3 Engineering Design Event (150 Points) ....25
7.3.1 Judging Sequence....25
7.3.2 Engineering Design Report Files File Format and Size....25
7.3.3 Engineering Design Spec Sheet File Format and Units....25
7.3.4 Penalty for late submission....26
7.4 Cost Event (100 Points)....26
7.4.1 Cost Event Scoring....26
7.4.2 Late submission of Cost Report....26
7.4.3 Addenda....27
7.4.4 Cost Report Penalties Process....27

**8 Dynamic Events 28**
8.1 Dynamic Events and Maximum score....28
8.2 Skid Pad Scoring....28
8.3 Autocross Scoring....28
8.4 Endurance Scoring....29
8.5 [FSE only] Efficiency Scoring....29
8.6 [FSC only] Fuel Efficiency Scoring....30

**9 Changelog 31**

# 1 Introduction

Since 2010, Formula Student Germany (hereafter "**FSG**") has been organising two competitions, Formula Student Combustion (hereafter "**FSC**") and Formula Student Electric (hereafter "**FSE**"). Both competitions take place at the same time and at the same event site.

This rules document contains the FSG rules for both competitions, FSC and FSE. These FSG specific rules are an addition to the 2016 Formula SAE® (hereafter **"FSAE"**) rules. In case of a conflict between the 2016 FSAE rules and the 2016 FSG rules, the 2016 FSG rules supersedes the 2016 FSAE rules.

# 2 Important Dates

Note, that for the penalties regarding late submission of documentation, 1 day exactly equals 24h. For further details see "3.4 Official Time".

## 2.1 Competition Dates and Place

FSG 2016 will be held from the 9th until the 14th of August 2016 in Hockenheim, Germany.

## 2.2 Registration

FSC: https://www.formulastudent.de/fsc/2016/registration/
FSE: https://www.formulastudent.de/fse/2016/registration/

### *2.2.1 Early Registration*

January 18th, 2016, 1200 CET

Early registrations will be processed in the received order of submission. It will start on the above specified date and end on January 24th, 2016, 1200 CET, or when all early registration slots have been filled. Early Registration can only be done online at the FSG website.

All remaining unused slots after the early registration phase has ended will become available for all other teams, when the main registration opens.

### *2.2.2 Main Registration*

January 25th, 2016, 1200 CET

Registration forms will be processed in the received order of submission, starting on the above specified date and ending on February 22th, 2016 1200 CET, or when the 75 cars for the FSC and the 40 cars for the FSE registration limit is reached. Registration can only be done online at the FSG website.

## 2.3 Structural Equivalency Spreadsheet (SES)

### 2.3.1 Submission of SES + 3 dimensional CAD model

April 1st, 2016, 1200 CEST

**All teams must submit a SES.** The spreadsheet form is supplied on the FSG website.

FSC: https://www.formulastudent.de/fsc/2016/rules/
FSE: https://www.formulastudent.de/fse/2016/rules/

Additionally, all teams must submit a 3 dimensional CAD model of the frame / monocoque including all members of the primary structure in "IGES" file format. The size of the "IGES" file is limited to 40MB.

For FSE: The accumulator container(s) and attachment method must also be included.

The completed SES form and the 3D-CAD model can be uploaded at the FSG website in the “My Team” area.

In the event that the FSG Technical Committee requests additional information or calculations, teams have **7 days** from the moment of the request to submit the requested information.

### 2.3.2 Submission of SES APPROVAL (only valid for monocoque cars)

July 1st, 2016, 1200 CEST

All teams with a monocoque car must submit a SES APPROVAL as one document in Adobe Acrobat® format (*.pdf file). A template of this approval will be supplied on the FSG website.

FSC: https://www.formulastudent.de/fsc/2016/rules/
FSE: https://www.formulastudent.de/fse/2016/rules/

The SES must be checked and approved by:

- A university professor or
- A validation/inspection organisation (e.g. DEKRA, TÜV, ...) or
- An engineering firm for lightweight structures or
- An engineering consultancy company

Once the SES has been approved by one of the previously mentioned institutions the SES APPROVAL form should be filled out and signed by this institution. The signed SES approval form can be uploaded at the FSG website in the “My Team” area.

An approval by any other official FSAE competition (mentioned in the FSAE 2016 Rule A2.1) will also be counted as an official approval.

The FSG Technical Committee will randomly double check submitted SES approvals with their respective submitted SES. In case of an inconsistency between the signed SES APPROVAL and the check of the FSG Technical Committee, the team has one chance to submit improvements/ answers within 72 hours. Teams, which do not answer within 72 hours, will be removed from the FSG 2016 competition.

## 2.4 Impact Attenuator Data (IAD)

April 1st, 2016, 1200 CEST

**All teams must submit a FSG IAD form**, along with the test results, description of the test setup, the used test equipment and photo documentation of the IAD before and after the test. A template of this IAD form is supplied on the FSG website.

FSC: https://www.formulastudent.de/fsc/2016/rules/
FSE: https://www.formulastudent.de/fse/2016/rules/

The completed IAD form can be uploaded at the FSG website in the “My Team” area.

In the event that the FSG Technical Committee requests additional information or calculations, teams have **7 days** from the moment of the request to submit the requested information.

## 2.5 [FSC only] Electronic Throttle Control (ETC) Notice of Intent and FMEA Upload

April 1st, 2016, 1200 CEST

ETC Notice of Intent and FMEA Data (FSAE 2016 Rule IC 1.17 and IC 1.18) must be uploaded to the 'My Team' area on the FSG website as one document in Adobe Acrobat® format (*.pdf file).

Late submission of the documentation will require the team to revert to a mechanical throttle arrangement.

## 2.6 [FSE only] Electrical System Form (ESF)

**All FSE teams must submit an Electrical System Form in the web-based system on the FSG website.**

In the event that the FSG Technical Committee requests additional information or calculations, teams have **7 days** from the moment of the request to submit the requested information.

NOTE: The ESFs will be reviewed in order of submission.

### *2.6.1 ESF Add Item Request (EAIR)*

April 1st, 2016, 1200 CEST

Please check whether all required items for your ESF are available in the database. Should items be missing in the ESF database, new items can be requested via the FSG website not later than the above specified date. https://www.formulastudent.de/eair

### *2.6.2 Electrical System Form*

April 29th, 2016, 1200 CEST

All Electrical System Forms must be completed on the FSG website not later than the above specified date. https://www.formulastudent.de/esf

## 2.7 Engineering Design Report and Design Spec Sheet

June 3rd, 2016, 1200 CEST

The Engineering Design Report must be uploaded to the 'My Team' area and the Engineering Design Spec Sheet must be completed online in the 'My Team' area on the FSG website.

The Engineering Design Spec Sheet Form can be found on the FSG website in the 'My Team' area prior the deadline.

## 2.8 Cost Report

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.

### *2.8.1 Electronic Copy*

June 3rd, 2016, 1200 CEST

The electronic copy must be the full report. This includes the full vehicle BOM, all parts & assemblies and supporting documentation. The cost calculations must be done with the help of the Cost Tables.

The upload of the cost report must be done in the three steps as shown below. Once all three steps have been completed, the submission of the cost report is complete.

1. Upload of the cost tables as a Microsoft Excel® file (.xlsx).

   For the electronic copy, the maximum allowed number of tabs must not exceed what has been given in the FSG_Master_eBOM. These tabs must also be given the same names as those stated in the FSG_Master_eBOM. The FSG Master eBOM can be found on the FSG website in the section Rules & Important Documents (Specific FSG change of FSAE 2016 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". All necessary assemblies and parts from each section must be included within the respective section. For other data, use the Supporting Material file.

2. Upload of the supporting material as one separate .pdf file.

   The supporting material should consist of drawings, exploded view drawings 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 does not match in total, or sum up in one section(5 USD tolerance for rounding), the higher price will be used and the team will be penalised with -10 (minus ten) points. These penalty points will be deducted from the Cost Event Score.

### *2.8.2 Written Copy*

The written copy must be identical to the electronic copy (the full report). The written copy will 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*

May 27th, 2016, 1200 CEST

AIRs to be considered for the Cost Event 2016 must be submitted not later than the above specified date.

An AIR must be required via the rules tool (see 3.2 Rules Questions) on the FSG website, by uploading the complete filled out EXCEL® template.
http://www.fsaeonline.com/content/Cost_Table_Add_Request.xls

### *2.8.4 Cost Addendum*

August 9th, 2016, 1200 CEST

The cost addendum must be uploaded to the 'My Team' Area on the FSG website not later than the above specified date.

## 2.9 Business Plan Executive Summary

June 3rd, 2016, 1200 CEST

The Business Plan Executive Summary must be uploaded to the 'My Team' area on the FSG website not later than the above specified date.

## 2.10 [FSC only] Fuel Type Order

June 17th, 2016, 1200 CEST

The team must inform FSG of the type of fuel they intend to use. The fuel type can be chosen after registration at FSG website in the 'My Team' area. The fuel types provided at FSC 2016 are expected to be 98 octane (ROZ 98) gasoline and E-85.

## 2.11 [FSE only] Charging Connector and max. Power

June 17th, 2016, 1200 CEST

Teams must inform FSG as to what charging connector will be used and what the maximum used charging power will be. The charging connector and maximum power can be chosen after registration at FSG website in the 'My Team' area.

## 2.12 [FSE only] Electrical System Officer(s) Qualification Upload

June 17th, 2016, 1200 CEST

To be accepted as a qualified ESO for FSE event several steps have to completed:

1. Each team member that is looking to become an 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 “2.13 Team Member Designation“.
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.

## 2.13 Team Member Designation

June 17th, 2016, 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 may 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
- Copy of the Health Insurance Certificate or copy of insurance confirmation letter
- 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 designations 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.

## 2.14 Scrutineering Quiz

April 29th, 2016, 1200 CEST

Participating teams must complete the Scrutineering Quiz. The scrutineering order at the event will be based on the time a team requires to complete the quiz. The fastest team will receive the first slot and 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 2016 rules (FSAE 2016 and FSG 2016 rules) and the FSG Event Handbook 2016.

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.

## 2.15 Vehicle Status Video (VSV) and Vehicle Status Report (VSR)

July 8th, 2016, 1200 CEST

All teams must upload a video showing the car driving using its own power prior to the competition. If teams can not upload a Vehicle Status Video (VSV), the team must upload a Vehicle Status Report (VSR) no later than the above specified date.

From the above specified date, the VSV and VSR submissions will be reviewed. All questions or required improvements must be answered/submitted within 72 hours. Teams, that do not answer within 72 hours will be removed from the FSG 2016 competition.

### *2.15.1 Vehicle Status Video*

The VSV can be uploaded at the FSG website in the “My Team” area.

The video must fulfil the following requirements and include two dynamic elements:

- may not exceed a length of 45 second and size of 20 MB
- file format must be common like avi, mpg, mp4, wmv
- showing the car from a 3rd person view
- first shot may not exceed a distance between car an camera of 4 meter
- the car must run on its own power
- dynamic sequence 1: acceleration from standing still
- dynamic sequence 2: cornering
- [FSE only] TSAL must be clearly visible
- [FSE only] Ready to drive sound must be working

Running the car with bodywork is not necessary, but strongly recommended. Rule “3.11 Testing and Work Safety“ applies.

### *2.15.2 Vehicle Status Report*

Teams which are not able to upload a VSV must hand in a Vehicle Status Report (File format: pdf / max. file size 5MB). A template of this report is supplied on the FSG website.

FSC: https://www.formulastudent.de/fsc/2016/rules/
FSE: https://www.formulastudent.de/fse/2016/rules/

The VSR can be uploaded at the FSG website in the “My Team” area. The upload of a Vehicle Status Report is not a replacement of the Vehicle Status Video, but can be considered as a delay to the necessary Vehicle Status Video.

# 3 General

## 3.1 FSG 2016 Rules

The FSG competition is compliant with the FSAE 2016 competition rules.
http://www.fsaeonline.com/content/2016_FSAE_Rules.pdf

The FSG rules presented in this document include specific rule changes and additions to the FSAE 2016 rules. These changes and additions supersede the specific sections of the published FSAE 2016 rules.

Additionally, all guidelines and clarifications posted in the 'Rules & Important Documents' sections on the FSG website for the current season are considered as official documents and therefore are applicable to the teams competing at FSG 2016.

FSC: https://www.formulastudent.de/fsc/2016/rules/
FSE: https://www.formulastudent.de/fse/2016/rules/

## 3.2 Rules Questions

Any rule clarification questions or rule ambiguities concerning the rules for FSG will be resolved by the FSG rules committee. The Rules Committee will answer both FSG and FSAE rule questions, but the decisions and clarifications given are only valid for the FSG competition and only for the present competition year.

Rules questions should be submitted via the online rules submission system on the FSG website. Before submitting, make sure to check the FAQ thoroughly to prevent asking questions on the rules which have already been answered. https://www.formulastudent.de/fsg/rules-faq/

Do not enquire about more than one rule per submission.

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

## 3.3 Official Language

The FSG official language is **English**.

## 3.4 Official Time

The FSG official time:

| From | Till | Time |
|---|---|---|
| 25.10.2015 | 27.03.2015 | Central European Time (CET) |
| 27.03.2016 | 30.10.2016 | Central European Summer Time (CEST) |

For all deadlines and decisions only the FSG server time is authoritative.

1 day equals 24 hours. One day later is 24 hours after the defined deadline time or reply time of an official.

Example:
Deadline: 01st March 1200 CET -> 02nd March 1200 CET = 24 hours later
Official Reply: 01st March 2234 CET -> 02nd March 2234 CET = 24 hours later

To convert CET or CEST to your local time you can use following website:
http://www.timeanddate.com/worldclock/converter.html

## 3.5 FSG Registration

### *3.5.1 Registration deadline*

The registration deadline for FSE and FSC is listed in the Important Dates section of this document, see “2.2 Registration“.

### *3.5.2 Registration capacity limit*

Slots will be given out, in the order in which they are received. The 2016 FSE competition will be limited to 40 teams and the FSC competition will be limited to 75 teams.

### *3.5.3 [FSE only] FSE Registration*

https://www.formulastudent.de/fse/2016/registration/

#### *3.5.3.1 FSE Early Registration for FSE Top6 Overall Finishers*

6 registration slots will be available for the FSE 2015 Top 6 overall finishers.

| Place | University |
|---|---|
| 1 | TU Delft |
| 2 | ETH Zürich |
| 3 | University of Stuttgart |
| 4 | Oregon State University - Corvallis |
| 5 | TU Freiberg |
| 6 | UAS Osnabrück |

#### *3.5.3.2 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.

### *3.5.4 [FSC only] FSC Registration*

https://www.formulastudent.de/fsc/2016/registration/

#### *3.5.4.1 FSC Early Registration for FSC Top11 Overall Finishers*

11 registration slots will be available for the FSC 2015 Top 11 overall finishers.

| Place | University |
|---|---|
| 1 | Oregon State University - Corvallis |
| 2 | University of Stuttgart |
| 3 | UAS Joanneum Graz |
| 4 | TU Graz |
| 5 | UAS Coburg |

| Place | University |
|---|---|
| 6 | Western University - London |
| 7 | University of Hertfordshire - Hatfield |
| 8 | FAU Erlangen-Nürnberg |
| 9 | UAS Esslingen |
| 10 | TU Wrocław |
| 11 | Techn. Hochschule Mittelhessen - Gießen |

#### *3.5.4.2 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 is taken from the valid list on the day when early registration starts. The World Ranking can be found here: http://www.fs-world.org

#### *3.5.4.3 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 | Number of Slots |
|---|---|
| Australasia, China and Japan | 3 |
| Europe (beside Germany) | 4 |
| North America | 4 |
| Rest of the world beside Europe | 4 |

### *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 FSG event, 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 17th, 2016, 1200 CEST.

### *3.5.7 Independent teams*

In the case that a university takes part in FSG 2016 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 Deadline and Penalties

### *3.6.1 General Aspects*

Missing a deadline results in penalties as specified below.

For FSG rules “2.3 Structural Equivalency Spreadsheet (SES)“, “2.4 Impact Attenuator Data (IAD)“, “2.6 [FSE only] Electrical System Form (ESF)“, the following penalties are applicable:

- Late submissions will be penalised with 10 (ten) points for each overdue day, up to a maximum of 70 points. These will be deducted from the team’s Total Score.
- Teams, that miss the deadlines by more than 7 days will be will be removed from the FSG 2016 competition.
- A late submission to a request from the FSG Officials later than 7 days will be penalised with 5 (five) points for each overdue day, up to a maximum of 35 points. These points will be deducted from the team’s Total Score.

For FSG rule “2.7 Engineering Design Report and Design Spec Sheet” the following penalty is applicable:

- Late submissions will be penalised with 10 (ten) points for each overdue day, up to a maximum of 100 points, which will be deducted from the team’s Engineering Design Event Score.
- If no report is submitted, this will result in a zero score for the Engineering Design Event.

For FSG rule “2.8 Cost Report” the following penalty is applicable:

- Late submissions will be penalised with 10 (ten) points for each overdue day, up to a maximum of 80 points. These will be deducted from the team’s Cost Event Score.
- If no report is submitted, thiswill result in a zero score for the Cost Event.

For FSG rule “2.9 Business Plan Executive Summary” the following penalty is applicable:

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

For FSG rule “2.15 Vehicle Status Video (VSV) and Vehicle Status Report (VSR)“ the following penalty is applicable:

- Late submissions will be penalised with 10 (ten) points for each overdue day, up to a maximum of 30 points. These will be deducted from the team’s Total Score.
- Teams who have missed the Vehicle Status Video and Vehicle Status Report deadline by more than 3 days will be de-registered from the FSG 2016 competition.
- If, after extending the VEHICLE STATUS VIDEO upload, by submitting a VEHICLE STATUS REPORT, a team does not then upload a valid VEHICLE STATUS VIDEO as specified in “2.15.1 Vehicle Status Video“ by July 22nd, 2016,1200 CEST, they will be de-registered from the FSG 2016 competition and will be replaced by the next team on the waiting list that uploaded a valid Vehicle Status Video.
- In case of a de-registering follow chapter “3.6.3 De-registration“: an upload within 24h is not necessary, but teams will be selected on a first drive-first select principle as long as the waiting list is opened.

### *3.6.2 Intentionally wrong submissions*

Teams, which upload obviously unusable information just to pass a deadline can be de-registered from the event in case of recurrence. Affected teams receive a warning in advance.

### *3.6.3 De-registration*

A team, that is de-registered from the event, has a single chance to apply for a placement on the waiting list. Within 24 hours after the submission of the de-registration notification, an informal application must then be sent to de-registration@formulastudent.de. Furthermore, the team has to correct the reason of de-registration within 24 hours (e.g. upload of a document).

If the application is positively confirmed by a FSG Official the team will be placed at the end of the waiting list. The team will additionally receive the full amount of penalties for the offense.

NOTE: Applications will be declined if the rework is inadequate or de-registration was caused by misbehaviour of the team.

## 3.7 Society Membership

Every participating team member must be a member of one of the FISITA engineering societies: http://www.fisita.com/membership/members.

## 3.8 Student Status

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

## 3.9 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.

## 3.10 Event Handbook

The FSG 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.

## 3.11 Testing and Work Safety

**FSG is not responsible for the use of the cars other than at the event in Hockenheim.**

Furthermore, the organisers of the FSG dissociate oneself from all activities of the teams besides FSG and associated events.

Nevertheless, all teams are advised to follow common practices and common sense when working on the vehicle and when operating the vehicle, also before and after the FSG event.

Cars designed and manufactured for the participation of Formula Student events should not participate in events not suitable for Formula Student vehicles like hill climbs, drag races or similar events. Teams should never use their cars for wheel-to-wheel races.

The following listed requirements should at least be met to qualify as a safe testing/running environment, but does not mean that following these guidelines guarantees safety under all circumstances.

- Driver wearing full protection gear incl. arm restraints
- Working TSAL, IMD, BMS/AMS, Torque Encoder plausibility check, torque/brake encoder plausibility check, brake system plausibility device and ETC plausibility check 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.

FSG reserves the right to disqualify a registered team in case of unsafe driving behavior, especially if the reputation of Formula Student organisers, sponsors and other teams is compromised. The decision to remove a team from the FSG 2016 competition 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

FSG will not accept entries complying with the Alternative Frame Rules (including accumulator container structure) unless they have been approved by other official FSAE competitions named in FSAE 2016 Rule A2.1 .

## 4.2 Drivers Cell

*Specific clarification of FSAE 2016 Rule T 3.5.5*

FSAE 2016 Rule T3.5.5 is valid for the primary structure (defined in FSAE 2016 Rule 3.3) in general, as long as the drivers cell is constructed following the Minimum Material Requirements (defined in FSAE 2016 Rule T3.4) rules or the Alternative Tubing and Material rules (defined in T3.5, T3.6 and T3.7 of FSAE 2016 Rule).

## 4.3 Impact Attenuator

### *4.3.1 Impact Attenuator Design*

*Specific FSG change of FSAE 2016 Rule T3.20.2*

Additional to the FSAE 2016 Rule T3.20.2 requirements Impact Attenuators must have a closed front section.

### *4.3.2 Impact Attenuator Testing*

*Specific FSG change of FSAE 2016 Rule T3.21.2*

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

### *4.3.3 Anti Intrusion Plate (AIP) Testing*

*Specific FSG change of FSAE 2016 Rule T3.38*

Equivalence of composite AIP to the baseline material (T3.20.3) must be shown by a physical test (T3.38.3). Results must be included in the SES

The composite AIP must be included the dynamic test of Impact Attenuator and must not fail.

A failure is defined if the IA plate is damaged in any way (e.g. broken) or the attachment points of AIP are destroyed.

## 4.4 Driver Egress

*Specific FSG change of FSAE 2016 Rule T4.8*

The driver egress, required by FSAE 2016 Rule T4.8 must be possible in all steering wheel positions.

## 4.5 Vehicle Identification

### *4.5.1 School Name*

*Specific FSG addition to FSAE 2016 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

Examples
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 FSAE 2016 T13.4*

The FSG 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.

Vehicles that are being entered into multiple competitions in the FSAE series must allow sufficient space along the nose centreline for all inspection stickers

### *4.5.3 Transponders*

*Specific FSG change of FSAE 2016 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 FSAE 2016 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 Tire and Rim Combination

*Specific FSG change of FSAE 2016 Rule T6.4.1*

During technical inspection each team needs to present one set of tires for dry conditions and one set of tires for wet conditions.

Tires on the same axle must have the same manufacturer, size and compound.

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

NOTE: Teams can use unmarked tires for the non-dynamic events.

NOTE: A defective tire can be replaced with an approved tire of the same manufacturer, size and compound.

## 4.8 Tires

*Specific FSG change of FSAE 2016 Rule T6.4.2*

Any treatment with any kind of traction enhancers is not allowed. Using a modified tire for any dynamic event will result in a DNF.

### 4.9 Steering System

*Specific FSG change of FSAE 2016 Rule T6.5.8*

Steering systems using cables or belts for actuation are prohibited.

### 4.10 Minimum Radii of edges

*Specific FSG change of FSAE 2016 Rule T3.23. and T9.5*

All other edges as named in T3.23. and T9.5 that could contact a pedestrian must have a minimal edge with a radii of at least 1 mm.

### 4.11 First Year Vehicles

Only first year vehicles may enter the FSG competition.

To be classified as a “first year vehicle”, as a minimum, the car must 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 organisers or judges may require.

### 4.12 Second Year Vehicles

Vehicles that have competed during any previous “Formula SAE Year” as defined in A6.5 of FSAE 2016 Rule are excluded from participating in FSG.

### 4.13 Inspection Holes

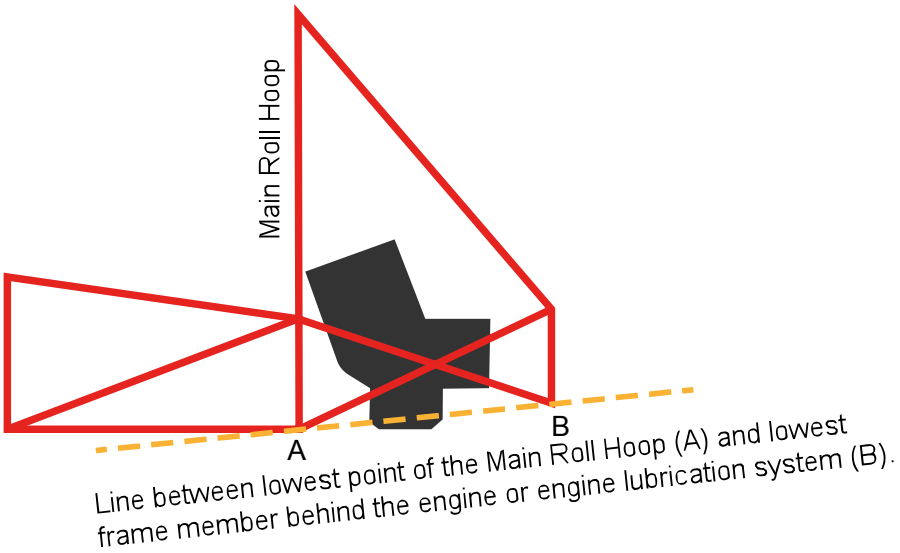
To allow the verification of tubing wall thickness, 4.5 mm (0.18 inch) inspection holes must be drilled in a non-critical location of both the Main Hoop and the Front Hoop **before technical inspection begins**. In addition, the Technical Inspectors may check the compliance of other tubes that have minimum 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 calliper, i.e. there must be access for the vernier calliper to the inspection hole and to the outside of the tube one hundred eighty degrees (180°) from the inspection hole.

### 4.14 External batteries

The use of external batteries (e.g. for an external jump start) inside the dynamic area is not permitted.

### 4.15 [FSC only] 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, 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.

### 4.16 [FSC only] Fuel Rails

*Specific FSG change of FSAE 2016 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.

### 4.17 [FSC only] Electronic Throttle Control (ETC)

*Specific FSG change of FSAE 2016 Rule IC1.11.3*

In case of using an unmodified 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.

### 4.18 [FSE only] Energy Meter LV Supply

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

### 4.19 [FSE only] Clarification on Accumulator Monitoring Systems

*Specific FSE addition to FSAE 2016 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.

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.

### 4.20 [FSE only] 100ms-continuity violations

*Specific FSG change of FSAE 2016 Rule EV2.2.4*

FSG will not punish 100ms-continuity violations.

## 4.21 [FSE only] Interlocks

*Specific FSG change of FSAE 2016 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.

## 4.22 [FSE only] Galvanic Separation in Accumulator Containers

### *4.22.1 Clarification on FSAE 2016 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.

### *4.22.2 Clarification on FSAE 2016 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.

## 4.23 [FSE only] Device to be used for checking compliance to FSAE®2016 EV3.6.3

FSG will install an independent cell temperature monitoring device for monitoring during the dynamic events. At the Accumulator Check the temperature measuring device DS1922T-F5 (iButton) will be installed in the accumulator according to the position defined and approved in the ESF.

## 4.24 [FSE only] Specific FSG rule for attachment of HV-components

The accumulator attachment to the major structure must follow T 11 of FSAE 2016 Rule. A usage of self locking helicoil inserts is not applicable. This also applies to electric motors.

# 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 [FSE only] Activating the tractive system

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

## 5.3 [FSC only] 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.

## 5.4 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. All-wheel driven cars must be able to lift up both axles at least 10.2 cm (4 in) off the ground.

# 6 Technical Inspection

## 6.1 Inspection & Testing Requirement

The Technical Inspection will be divided in an electrical inspection for FSE cars and a mechanical inspection for FSE and FSC cars.

The electrical inspection will declare the electric car as electrically safe. Before passing E-Scrutineering the electric 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. restrictor, 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 may only be replaced by a scrutineer.

The Technical Inspection sheet will be made available on the FSG website.

FSC: https://www.formulastudent.de/fsc/2016/rules/
FSE: https://www.formulastudent.de/fse/2016/rules/

The scrutineering procedure for FSE and FSC cars will be described in the FSG 2016 Event Handbook.

## 6.2 [FSE only] 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 FSAE 2016 rule EV8.5

## 6.3 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 penalised -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 Static Events

## 7.1 Business Logic Case

*Specific FSG change of FSAE 2016 Rule S3*

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

## 7.2 Business Plan Presentation (75 Points)

### *7.2.1 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

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

### *7.2.2 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 must 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.

### *7.2.3 Data Projection Equipment*

Video Projectors will be provided by FSG. These Projectors will have VGA Input Connectors. The organisers will not provide any other presentation equipment. Teams planning to use other presentation equipment as a part of their presentation, are responsible for bringing or otherwise arranging for their own equipment.

### *7.2.4 Judging Sequence*

At FSG 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

### *7.2.5 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**

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

$P_{max}$ is the highest score awarded to any team not participating in the finals
$P_{your}$ 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; normalise the scores of different judging teams.

## 7.3 Engineering Design Event (150 Points)

### *7.3.1 Judging Sequence*

At FSG Engineering Design Judging will consist of two parts:

I. Initial judging of all vehicles

II. Final judging ranking

### *7.3.2 Engineering Design Report Files File Format and Size*

The FSG 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.

### *7.3.3 Engineering Design Spec Sheet File Format and Units*

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

The form is in metric units.

### *7.3.4 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.

## 7.4 Cost Event (100 Points)

### *7.4.1 Cost Event Scoring*

*Specific FSG change of FSAE 2016 Rule S4.8*

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

| | |
|---|---|
| 20 Points | 20 Points lowest cost - each of the participating teams 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 following formula. |

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

$P_{your}$ 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. |
| 100 Points | Total |

### *7.4.2 Late submission of Cost Report*

*Specific FSG change of FSAE 2016 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.

### *7.4.3 Addenda*

*Specific FSG change of FSAE 2016 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 23th, 2016, 1200 CEST (Adobe Acrobat® format (*.pdf file)).

### *7.4.4 Cost Report Penalties Process*

*Specific FSG change of FSAE 2016 Rule S4.18*

Only penalty method A will be used for FSG, described in Rule S4.19 "Penalty Method A- Fixed Point Deductions" of the FSAE 2016 Rules. The FSAE 2016 Rule S4.20 "Penalty Method B – Adjusted Cost Deductions" is not valid for the FSG competition.

# 8 Dynamic Events

## 8.1 Dynamic Events and Maximum score

*Specific FSG change of FSAE 2016 Part D Article 1*

| | |
|---|---|
| Skid Pad | 75 |
| Acceleration | 75 |
| Autocross | 100 |
| Efficiency | 100 |
| Endurance | 325 |
| Total | 675 |

## 8.2 Skid Pad Scoring

*Specific FSG change of FSAE 2016 D6.8.3*

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

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

| | |
|---|---|
| $T_{your}$ | 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.

## 8.3 Autocross Scoring

*Specific FSG change of FSAE 2016 D7.8.1*

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

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

| | |
|---|---|
| $T_{min}$ | 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.

## 8.4 Endurance Scoring

*Specific FSG change of FSAE 2016 D8.20.2*

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

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

| | |
|---|---|
| $T_{min}$ | 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.

## 8.5 [FSE only] Efficiency Scoring

*Specific FSG change of FSAE 2016 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

$$EfficiencyScore = 100x \frac{\left(\frac{EfficiencyFactor_{min}}{EfficiencyFactor_{your}} - 1\right)}{\left(\frac{EfficiencyFactor_{min}}{EfficiencyFactor_{max}} - 1\right)} \quad EfficiencyFactor = \left(\frac{T_{min/Lap}}{T_{yours/Lap}}\right) x \left(\frac{E_{min/Lap}}{E_{yours/Lap}}\right)^2$$

| | |
|---|---|
| $T_{min/Lap}$ | 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.

## 8.6 [FSC only] Fuel Efficiency Scoring

*Specific FSG change of FSAE 2016 Rule D8.21, D8.23.3 and D8.23.4*

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

$$Efficiency = 100x \frac{\left(\frac{EfficiencyFactor_{\min}}{EfficiencyFactor_{your}} - 1\right)}{\left(\frac{EfficiencyFactor_{\min}}{EfficiencyFactor_{\max}} - 1\right)} \qquad EfficiencyFactor = \left(\frac{T_{\min/laptotal}}{T_{yours/lapyours}}\right) x \left(\frac{V_{\min/laptotal}}{V_{yours/lapyours}}\right)$$

| | |
|---|---|
| $V_{min}$ | is the smallest volume of fuel used by any competitor, who fulfils Tyour < 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. |

# 9 Changelog

**10th of December 2015 - Version 1.0.0**

- Initial release