2015 Formula Student Rules

2015 Formula Student Rules
INTRODUCTION

The Formula SAE rules have moved to a 2 year rules cycle such that only on odd years will major changes be made to the regulations. The publication of 2015 Formula SAE Rules will govern 2015-2016 competition years, however, if the organizers and FSAE Rules Committee find a need to make a change in even years they have the authority to do so. Regardless of this policy, please note that rule changes for Electric Vehicles (EV) may take place yearly.

For the 2015 rules, any changes can be identified by text that is in italics.

For Formula Student there are a couple of specific additional regulations.

Caution – Neither this introduction, nor any other summary, is a substitute for reading and understanding the Rules. The Rules are both a controlling and a reference document and should be used for those purposes. Do not attempt to design your car based on the parts of the Rules you happen to remember from the last time you read them. We cannot stress it too strongly – Read the Rules thoroughly and repeatedly.

For 2015, there are approximately 100 regulation changes that have been implemented. Most of the changes have been implemented to make the regulations clearer with the intent to make it easier for teams to produce a rules compliant vehicle. The following list includes some of the more significant regulation changes which are likely to change the engineering challenge for teams.

T3.6 – Thinner tubing is allowed in the chassis structure if welds are validated by testing
T6.5 – Rear Wheel Steering is allowed
T9 – Regulations governing where aerodynamic devices can be positioned have been re-written
AF4.8 – Alternative Frame Rules for Accumulator Containers
IC1.6 – The position of the compressor for intake systems has been changed so that it must now be after the restrictor
IC1.12-1.16 – Electronic Throttle Control is now permitted
IC3.1.4 – Porous or fibrous covering on exhaust is banned
IC4.6 – A voltage limit is specified for LV systems with IC Engines
EV – LiFePO4 will be treated the same as other Li Ion Cells
EV1.1.1 – The grounded low voltage limit has been raised to *60V* DC
EV2.2 – The battery power limit for EVs has been lowered to 80kW
EV3.4 – Accumulator containers now have standard regulations governing construction of the container. Alternatively it is possible to follow the new AF regulations for Accumulator containers
EV8.2 – Accumulators must be removed from the vehicle for charging

ARTICLE 1: FORMULA SAE OVERVIEW AND COMPETITION – AS ARTICLE 1 FROM 2015 FSAE RULES EXCEPT

Formula Student permits students to compete with running vehicles built to the FSAE or Formula Student rules in Class 1 and vehicles which are in the design process can compete in Class 2. This set of regulations deals with Class 1, i.e. running vehicles.

In each case either the FSAE regulation is referenced in which case the FSAE regulation must be followed or new or additional text is supplied in the Formula Student Regulation. In all cases, if additional or new text is supplied in these Formula Student regulations then the additional or new text takes precedence over the FSAE regulation.

Class 2 designs are assumed to be focused on providing ultimately a Class 1 (running vehicle) entry. The Class 2 regulations can be found on the Formula Student Website.

A1.1 Formula SAE Competition Objective

The Formula Student competition embodies the same objectives as The Formula SAE ® Series (see 2015 FSAE Rules A1.1) but it also allows the development of alternatively fuelled vehicles.

A1.1.1 Alternatively fuelled vehicles (those that do not have powertrains that comply with FSAE rules) will be considered on a case by case basis. Any team wishing to use an alternative powertrain technology must declare their intent to the organisers by a date in December as defined in the Key Dates Document which can be found on the Formula Student Website by submitting the required report – see A1.1.2.f. The report will be reviewed by the Formula Student Technical Experts to ensure that the technology is acceptable to be used at Formula Student. Failure to provide satisfactory information on the intended design in a timely manner will mean that the entry will not be awarded. Organisers reserve the right to refuse entry should the vehicle, at event time, be significantly different to that originally proposed, described and accepted.

A1.1.2 An overview of the main regulation differences for those vehicles using alternative powertrains is as follows:

a. For alternative powertrain vehicles, a wide range of fuels, prime movers and hybrid vehicles with more than one form of power can be used. These vehicles will compete directly against all vehicles built to FSAE rules.

b. During the endurance event the fuel efficiency of all vehicles will be measured in terms of the production of CO_2 measured in kg. The quantity of CO_2 released to the atmosphere by the consumption of each allowable fuel is specified in the rules FSAE rules D8.22.1 and is intended to represent the UK average number for the type of fuel under consideration.

c. As part of the cost event, a sustainability section will evaluate the embedded CO_2 and energy in the vehicle powertrain of all vehicles via presentation.

d. Any alternatively fuelled combustion engine, whether the sole prime mover or part of a hybrid powertrain, must use a 4 stroke cycle engine with a maximum capacity of 610cc.

e. Allowable Power Sources - The allowable forms of power in addition those covered by the FSAE rules (Petrol, E85 and Electric) are specified as Diesel, Hydrogen, Hydrogen fuel cell and combinations of all the above forms of power to create a hybrid but the organising committee will consider requests for other fuels such as Liquid Petroleum Gas (LPG) and Compressed Natural Gas (CNG) to be added to this list.

f. Any team intending to submit an alternative fuel entry (entries that do not comply with FSAE rules) must submit a short report (5 A4 pages maximum) by the a date in December as defined by the Key Dates Document outlining the fuel or combination of fuels that the team intends to use, how the fuel will be transported and stored at the event, details of how the powertrain will work and any possible risks and how these might be mitigated. Subsequent discussions with the Formula Student Technical Committee will determine whether an entry can be accepted and what additional regulations the entry must respect.

g. Once an alternatively fuelled vehicle's entry is accepted, the team must complete reports equivalent to those required by EVs, namely the FMEA and ESF before the vehicle will be allowed to run at the competition.

A1.2 Vehicle Design Objectives

For the purpose of the Formula Student competition, teams are to assume that they work for a design firm that is designing, fabricating, testing and demonstrating a prototype vehicle for the non-professional, weekend, motorsport competition market.

A1.2.1 The vehicle may adopt alternative powertrain technologies such that it is high performance, whilst the amount of CO_2 it emits is as low as feasibly possible and the CO_2 and energy embedded in the vehicle is minimised. Recyclability must also be considered in the design.

A1.2.2 The vehicle should have high performance in terms of acceleration, braking and handling and be sufficiently durable to successfully complete all the events described in the Formula Student /FSAE Rules and held at the Formula Student competition.

A1.2.3 The vehicle must accommodate drivers whose stature ranges from 5th percentile female to 95th percentile male and must satisfy the requirements of the Formula SAE Rules.

A1.2.4 Additional design factors to be considered include: aesthetics, cost, ergonomics, maintainability, manufacturability, and reliability.

A1.2.5 Once the vehicle has been completed and tested, your design firm will attempt to obtain a business deal with a corporation interested in either manufacturing and selling your design or investing in your company to do the same. The challenge to the design team is to develop a prototype car that best meets the Formula Student vehicle design goals and which can be **profitably** marketed.

A1.2.6 Each design will be judged and evaluated against other competing designs to determine the best overall car.

A1.3 Good Engineering Practices

Vehicles entered into Formula SAE competitions are expected to be designed and fabricated in accordance with good engineering practices.

A1.4 Judging Categories

The cars are judged in a series of static and dynamic events including: technical inspection, cost, manufacturing & sustainability, business presentation, and engineering design, solo performance trials, and high performance track endurance.

The dynamic events are scored to determine how well the car performs. Each dynamic event has specified minimum acceptable performance levels that are reflected in the scoring equations.

The following points are possible:

Static Events:

Business Presentation	75
Engineering Design	150
Cost, Manufacturing & Sustainability	100

Dynamic Events

Acceleration	75
Skid-Pad	50
Autocross/Sprint	150
Efficiency	100
Endurance	300
Total Points	1,000

ARTICLE 2: THE 2015 FORMULA SAE SERIES – AS PER 2015 FSAE RULES

ARTICLE 3: FORMULA SAE RULES AND ORGANISER AUTHORITY – AS PER 2015 FSAE RULES

ARTICLE 4: INDIVIDUAL PARTICIPATION REQUIREMENTS

A4.1 Eligibility Limits

Eligibility is limited to undergraduate and graduate students to insure that this is an engineering design competition.

A4.2 Student Status

Team members must be enrolled as degree seeking undergraduate or post graduate students in the college or university of the team with which they are participating. Team members who have graduated during the seven (7) month period prior to the competition remain eligible to participate.

Note: Teams which are formed with members from two or more Universities are treated as a single team. A student at any University making up the team may compete at any event where the team participates. The multiple Universities are in effect treated as one University with two campuses and all eligibility requirements (one car per competition class, one registration slot, etc.) is enforced. For Formula Student, joint entries with a Technical College are allowed, but in this case the entry must be under the University name.

A4.3 Society Membership

A4.3.1 Students studying at a UK university must be a member of the Institution of Mechanical Engineers to compete at Formula Student. Affiliate membership is FREE to

all Formula Student team members, regardless of discipline. To apply for Affiliate Membership, follow these easy steps:

- Complete the **online registration form** to set up an account.
- Once logged into your account, click on the left-hand side link 'Student Affiliate Form'
- Fill in your personal details and follow the prompts to submit your application.

Team Leaders need to ensure that all UK team members become IMechE members as defined in the Key Dates Document which can be found at: http://www.formulastudent.com/formula-student/Teams/key-dates . All membership numbers need to be quoted in the Team Member Details section of your account prior to the event. Faculty Advisor membership is optional.

A4.3.2 International students with a 'home FS competition' may be a member of the engineering organisation that organises their home event (i.e. we will accept German students who are VDI members). If you do not have one of these home events in your country: SAE International, SAE Australasia, SAE Brazil, VDI, VDE, or ATA, your team must become IMechE members. Affiliate membership is FREE to all Formula Student team members, regardless of discipline. To apply for Affiliate Membership, follow these easy steps:

- Complete the online registration form to set up an account.
- Once logged into your account, click on the left-hand side link 'Student Affiliate Form'
- Fill in your personal details and follow the prompts to submit your application.

Team Leaders need to ensure that all international team members become IMechE as defined in the Key Dates Document which can be found at: http://www.formulastudent.com/formula-student/Teams/key-dates. All membership numbers need to be quoted in the Team Member Details section of your account prior to the event. Faculty Advisor membership of an engineering institution is optional.

A4.3.3 Please note that students who became an IMechE Affiliate member last year do not need to apply again, but need to inform membership@imeche.org that they are continuing to compete in Formula Student 2015.

A4.4 Age

Team members must be at least eighteen (18) years of age prior to the official start date of the event.

A4.5 Driver's Licence

Team members who will drive a competition vehicle at any time during a competition must hold a valid, government issued driver's licence or a recognised (ASN) approved karting or car motorsport licence.

A4.6 Driver Restrictions

Drivers who have driven for a professional racing team in a national or international series at any time may not drive in any competition event. Definition: A "professional racing team" is defined as a team that provides racing cars and enables drivers to compete in national or international racing series and employs full time staff in order to achieve this.

A4.7 Liability Waiver

All on-site participants, including students, faculty and volunteers, are required to sign a liability waiver upon registering on-site.

A4.8 Medical Insurance

Non-EU team members who will drive a competition vehicle at any time during a competition must have valid and suitable medical insurance.

A4.9 Individual Registration Requirements for FSUK – ACTION REQUIRED

A4.9.1 Team Leaders must ensure that every participants, including Faculty Advisors, name is listed on their team's online Team Details account page on their FS Account. It is the Team Leader's responsibility to ensure that all information is current. The following is also required:

- Driver licence numbers must be listed for participants who intend to drive a competition vehicle.
- IMechE membership number (only for UK teams and teams without a 'home FS competition')
- Emergency Contact Details (point of contact (parent/guardian, spouse), relationship, and phone number) must be completed online by the deadline specified on the Key Dates webpage. Drivers' blood group is only required if known. Team Leaders must supply emergency contact details for each team member and Faculty Advisor.

A4.9.2 **Onsite Registration Requirement**

ONSITE REGISTRATON IS REQUIRED OF ALL TEAM MEMBERS AND FACULTY ADVISORS.

All FS car drivers must bring their government issued driver's licence to onsite registration. Non-EU FS car drivers must also bring their medical insurance card or documentation to onsite registration.

ARTICLE 5: FACULTY ADVISOR, ELECTRICAL SYSTEM OFFICER AND ELECTRICAL SYSTEM ADVISOR

A5.1 Faculty Advisor

A5.1.1 Each team is expected to have a Faculty Advisor appointed by the university. The Faculty Advisor is expected to accompany the team to the competition and will be considered by competition officials to be the official university representative.

A5.1.2 Faculty Advisors may advise their teams on general engineering and engineering project management theory.

A5.1.3 Faculty Advisors may not design any part of the vehicle nor directly participate in the development of any documentation or presentation.

Additionally, Faculty Advisors may not fabricate nor assemble any components nor assist in the preparation, maintenance, testing or operation of the vehicle.

In Brief – Faculty Advisors may not design, build or repair any part of the car.

A5.2 Electrical System Officer – Electric Teams only

A5.2.1 Every participating team has to appoint at least one electrical system officer (ESO) for the event. This person is responsible for all electrical operations of the vehicle during the event.

A5.2.2 The ESO is responsible for every kind of work at the car during the event.

A5.2.3 The ESO is the only person in the team that is allowed to declare the car electrically safe, so that work on any system of the car may be performed by the team.

A5.2.4 The ESO must be a valid team member, which means that he/she has to have student status, see A4.2.

A5.2.5 The ESO must be contactable by phone at all times during the event.

A5.2.6 The ESO must accompany the car whenever it shall be operated or is moved around at the event site.

A5.2.7 The ESO is not allowed to be a driver, if no second ESO is named by the team who is not a driver.

A5.2.8 The ESO must be properly qualified.
The ESO must be certified or must have received appropriate practical training whether formal or informal for working with high voltage systems in automotive vehicles. Details of the training must be provided to the organisers on the ESO/ESA form for approval.

A5.3 Electric System Advisor – Electric and Alternative Fuel Teams only

A5.3.1 The Electrical System Advisor (ESA) must be a professionally competent person(s) nominated by the Entrant who can advise on the electrical and control systems that will be integrated into the vehicle. It is acceptable for the faculty advisor to be the ESA if all the requirements below are met.

A5.3.2 The ESA must supply details of their experience of electrical and/or control systems engineering as employed in the car on the ESO/ESA form for approval by the organisers. It is likely that the ESA will be a Chartered Engineer or someone of equivalent status.

A5.3.3 The ESA must have significant experience of the technology that is being developed and its implementation into vehicles or other safety critical systems such that they are adequately qualified to advise the team on their proposed electrical and control system designs.

Note: It may be necessary to have more than one person to achieve this requirement.

A5.3.4 The ESA must advise the team such that the merits of any relevant engineering solutions can be discussed, questioned and approved before being implemented into the final vehicle design.

A5.3.5 The ESA should advise the students on the required training such that they are competent to work with the systems on the vehicle.

A5.3.6 The ESA(s) must review and sign the Electrical System Form and FMEA documents to confirm that in principle the vehicle has been designed using good engineering practices.

A5.3.7 The ESA must ensure that the team discusses any unusual aspects of the design with the rules committee to reduce the risk of exclusion or significant changes being required to pass technical inspection.

ARTICLE 6: VEHICLE ELIGIBILITY – AS PER 2015 FSAE RULES EXCEPT

A6.9 Second Year Vehicles: Formula Student

A6.9.1 Second year vehicles are not allowed

ARTICLE 7: REGISTRATION

A7.1 Registration – Formula Student

Registration for Formula Student must be completed on-line. Online registration must be done by the Team Leader and official Faculty Advisor connected with the registering university.

A7.2 Entries per University – Formula Student – One per Competition

Registration for Formula Student in the UK is limited to one (1) vehicle regardless of powertrain type per university depending on available space. However, the organisers reserve the right to allow up to three universities to compete with a second car where this second car has novel or interesting technology incorporated and is sufficiently different to other entries.
Note: The Institution of Mechanical Engineers takes a view that the automotive industry will have to be open to many technologies in the future and this policy supports that view.

A7.3 Registration Limits - Formula Student

Registration for Formula Student is limited to 110 competing cars in Class 1. There is no limit to how many Class 1 teams are on the reserve list or how many teams compete in Class 2. A reserve team will be notified when a registration slot becomes available.

A7.4 Registration Dates – Formula Student

Registration for Formula Student will open at the date and time posted on the competition website.

Registration for Formula Student will close at the date and time posted on the competition website.

There are no exceptions to this registration policy.

A7.6 Registration Fees

A7.6.1 Registration fees must be paid to the Institution of Mechanical Engineers by the deadline specified on the Formula Student website.

A7.6.2 Registration fees are not refundable and may not be transferred to a subsequent year's competition.

A7.6.3 Class 1 teams may change their entry to Class 2 but only up until the date which this is allowed. Please see the key dates document: http://events.imeche.org/formula-student/Teams/key-dates

A7.7 Withdrawals

A7.7.1 Registered teams that find that they will not be able to attend the competition are requested to officially withdraw by notifying the following no later than one (1) week before the event:

A7.7.2 Formula Student Event withdrawals: formulastudent@imeche.org

A7.7.3 If a team withdraws from the competition and plans to compete with the same car at FS2015, then they must not compete in any official FS2015 events or get any formal feedback from scrutineers, judges or any other Official. An official withdrawal confirmation will be sent via email by a Formula Student official to the Team Leader.

A7.8 Newcomer Registration

Teams who will be presenting in their first season of the FSAE/FS calendar with a running vehicle and have not won a major award at a previous competition, and teams that have been absent from FSAE/FS for at least 5 years will be eligible for the Newcomer Award as long as they register their status with the IMechE in accordance with the deadline as described on the FS website.

A7.9 Vehicle Shipping

Vehicle shipments by commercial carrier must comply with the laws and regulations of nations from which, and to which, the car is being sent. Teams are advised to consult with their shipping company or freight forwarder to be sure their shipment fully complies with all relevant, customs, import/export and aviation shipping requirements.

Shipments must be sent with the sending team or university listed as the receiving party. Neither the competition organisers nor the competition sites can be listed as the receiving party. The Institution of Mechanical Engineers will not take responsibility for any cars.

ARTICLE 8: VEHICLE DOCUMENTATION, DEADLINES AND PENALTIES

A8.1 Required Documents and Required Forms

The following documents supporting each vehicle must be submitted by the action deadlines posted on each competition website or otherwise published by the organisers.

A5 "Electrical Systems Officer and Electrical Systems Advisor Form" - Use required form located at http://www.formulastudent.com/formula-student/Teams/forms

T3.9 "Structural Equivalency Spreadsheet (SES)" and Appendix B-1 - Use required form located at http://www.formulastudent.com/formula-student/Teams/forms Note – Teams must submit an SES unless using the AF Rules in which case the SES is superseded by the SRCF. Submit either the SES or the SRCF as required, but not both.

T3.22 "Impact Attenuator Data Requirement" - Use required form located on the competition website http://www.formulastudent.com/formula-student/Teams/forms

PART IC - IC2.1 "Fuel" – Some competitions require a fuel type order – Check the relevant website

S3 "Business Logic Plan" – Use required form located on the competition website at http://www.formulastudent.com/formula-student/Teams/forms

S4 "Cost, Manufacturing and Sustainability Report" - Report must comply with the Cost and Sustainability Event Rules. An electronic version of the Cost Report e-bom

to be submitted pre-event and a hard copy version of the Cost, Manufacturing and Sustainability report at the event are required.

S6.2 "Design Report" – Report must comply with the Design Event Rules

S6.3 "Design Spec Sheet" – Use required form located at http://www.formulastudent.com/formula-student/Teams/forms

EV9.1 Electric and alternative fuelled vehicles only - "Electrical System Form" – Use required form, available on the competition website at http://www.formulastudent.com/formula-student/Teams/forms

EV9.2 Electric and alternative fuelled vehicles only - "Failure Modes and Effects Analysis" – Use required form, available on the competition website at http://www.formulastudent.com/formula-student/Teams/forms

"Alternative Fuel Report" – to be submitted to Formula Student by e-mail to: formulastudent@imeche.org.

"Essential Information" – to be submitted via your team account

"Final Team Member Details" - to be submitted via your team account

"Emergency Contact Details" - to be submitted via your team account

Each team is required to submit their Essential Information for the Event Programme. This consists of technical data, up to 200 words about your team/concept, 4 .jpg images including a main image of your car and 3 CAD images on a white background (front, side and top view).

Your Essential Information forms the basis of the material that the organisers print about each team in the Formula Student Event Programme and may be used by the organisers for pre-event PR, press releases etc. It will also be shown to the Business Presentation judges and commentators prior to the event, and is an opportunity to promote the team, university and car. As well as talking about the design choices you have made, and the key development features of your car, the text may also include how the team is organised, main objectives, etc. Teams must submit their Essential Information via their Team Account. After the deadline, teams will be given 14 days to upload any amendments before their account will not accept any further versions being uploaded.

A8.2 Deadlines

Volunteer judges evaluate all the required submissions and it is essential that they have enough time to complete their work. There are no exceptions to the document submission deadlines and late submissions will incur penalties. Please note that different documents or submissions have different deadlines – check the website: http://www.formulastudent.com/formula-student/Teams/key-dates.

A8.3 Submission Addresses and Formats

The procedures for submitting documents and the websites and/or addresses to which the various documents should be sent are published on the website or otherwise released by the organisers. Most required documents must be submitted in a format specified in the individual event rules or using a prescribed form. Failure to

submit a document in the proper format, or with an incorrect file name, will be considered as "Not Submitted."

Carefully read these rules and check the website.

A8.4 Late Submission Penalties

Most documents are required to be uploaded to the FS website before the event. There are varying deadlines for different documents. Lateness is discouraged by penalties. For some documents the website will not permit documents to be uploaded after the maximum lateness (the "No Submissions Accepted After" date). Documents received /uploaded after the deadline will be penalised negative ten (-10) points per day, or partial day, late with the following penalty caps and exclusions:

A5 "Electrical Systems Officer and Electrical Systems Advisor Form" - The penalty for late ESO/ESA forms is capped at negative fifty (-50) points.

T3.9 "Structural Equivalency Spreadsheet (SES)" **or** AF2 "Structural Requirements Certification Form (SRCF)" – The penalty for late SES/SRCF submission is capped at negative fifty (-50) points.

However, teams are advised that SES/SRCF forms are evaluated in the order in which they are received and that late submissions will be reviewed last. Late SES/SRCF approval could delay the completion of your vehicle. We strongly recommend you submit your SES/SRCF as early as possible.

T3.22 "Impact Attenuator Report Penalties" - The penalty for late Impact Attenuator Report submissions is capped at negative fifty (-50) points.

PART IC - IC2.1 "Fuel" – There is no point penalty for late submission of a fuel type order, however once the deadline has passed your team will be allocated the basic fuel type.

Rules S3 "Business Logic Case" – The penalty for late submission of the BLC is capped at negative fifty (-50) points.

Rule S4.16 "Late Submission of Cost, Manufacturing Report e-bom" – For the first 15 days after the deadline submission penalties for late Cost, Manufacturing & Sustainability Reports are capped at negative eighty (-80) points. After the first 15 days a late Cost, Manufacturing & Sustainability Report is classified as "Not Submitted". Cost, Manufacturing & Sustainability Reports that are not submitted will receive negative one hundred (-100) points and may not participate in the Cost & Sustainability Event.

Rule S6.8 "Penalty for Late Submission or Non-submission" – The Design Report and Design Spec Sheet collectively constitute the "Design Documents". Late submission or failure to submit all, or any one, of the Design Documents will be penalised at the standard negative ten (-10) points per day to a maximum of negative one hundred (-100) points. If your Design Documents are received more than ten (10) days late they will be classified as "Not Submitted" and your team will not participate in the Design Event and will receive zero (0) points for design.

EV9.1 "Electrical System Form" The penalty for late ESF submissions is capped at negative fifty (-50) points. If the ESF is received more than ten (10) days late it will be classified as "Not Submitted" and your vehicle will not be inspected and will not be permitted to compete.

EV9.2 "Failures Modes and Effects Analysis" The penalty for late FMEA submissions is capped at negative fifty (-50) points. . If the FMEA is received more than ten (10) days late it will be classified as "Not Submitted" and your vehicle will not be inspected and will not be permitted to compete.

"Essential Information for the Event Programme" - The penalty for late Essential Information submissions is capped at negative fifty (-50) points.

This rule is only a summary. Read the individual section rules for complete document submission requirements. Check the website for deadlines, submission addresses and other details. If you have any questions, please submit them on the FS Question Database: http://teams.formulastudent.com/faq/FAQ.aspx

A8.5 Web Based Submission –

Teams entering Formula Student must submit the following documents online through the FS website

A1.6.1 "Alternative Fuel Report"
A5 Electrical Vehicles Only "Electrical Systems Officer and Electrical Systems Advisor Form"
A8.1 "Essential Information"
A8.1 "Final Team Member Details"
A8.1 "Emergency Contact Details"
T3.9 "Structural Equivalency Spreadsheet (SES)" and Appendix B-1
T3.22 "Impact Attenuator Data Requirement"
S3 "Business Logic Plan"
S6.2 "Design Report"
S6.3 "Design Spec Sheet"
S4.9 "Cost Report e-bom table excel format"
EV9.1 Electric and Alternative Fuel vehicles only - "Electrical System Form"
EV9.2 Electric and Alternative Fuel vehicles only - "Failure Modes and Effects Analysis"

Submissions must be uploaded to the Formula Student website no later than 17.00hrs, co-ordinated universal time (UTC), on the deadline day. To convert UTC to your local time you may use following website: www.timeanddate.com/worldclock/converter

A confirmation email stating the time of your upload will be sent to your primary team contact (the person who completed your FS2015 registration form) after each submission. You are strongly advised to print and retain this confirmation email for the final version of each submission. If the primary contact email changes you need to inform formulastudent@imeche.org.

Teams have the option to replace uploaded documents with a new file at any time. However, between the "Submission Due Date" (document deadline before lateness applies) and the "No Submissions Accepted After" date such replacements are classified as late submissions and the appropriate penalties will be applied except when the replacement document is requested by the Formula Student Technical Committee in order to clarify a technical aspect of the car such that the report can be successfully passed – this is limited to the SES, IAD, ESF and FMEA.

Documents may not be uploaded or replaced following the "No Submissions Accepted After" deadline, such as the Essential Information submission and Design Documents.

The purpose of the above is to help the volunteer judges who are reviewing your hard work.

A8.6 Team Accounts – Formula Student

Uploading Documents – Team Leaders are responsible for ensuring that all of their team's submissions are uploaded before the deadline.

Document Access – Uploaded documents can only be viewed by (1) your Team Leaders, Deputy Team Leaders and Faculty Advisors, (2) authorised judges, technical inspectors and officials and (3) IMechE staff.

Reminder – The website does not know what you intended to submit or what you thought you were doing. Anything your team uploads to the site is considered to be an official action by your team.

Account creation for online document submission is explained on the FS website.

ARTICLE 9: PROTESTS – AS PER 2015 FSAE RULES

ARTICLE 10: QUESTIONS ABOUT THE FORMULA SAE RULES – AS PER 2015 FSAE RULES

A10.1.1 Teams entering only Formula Student:
Submit questions to the Formula Student Questions Database
Website: http://teams.formulastudent.com/faq/FAQ.aspx

APPENDIX S – SAE TECHNICAL STANDARDS

The SAE Technical Standards Board (TSB) has made the following SAE Technical Standards available on line, **at no cost**, for use by Collegiate Design teams. Standards are important in all areas of engineering and we urge you to review these documents and to become familiar will their contents and use.

The technical documents listed below include both (1) standards that are identified in the rules and (2) standards that the TSB and the various rules committees believe are valuable references or which may be mentioned in future rule sets.

All Collegiate Design Series teams registered for competitions in North America have access to all the standards listed below - including standards not specific to your competition.

See FSAE Rule A3.11 "Technical Standards Access" for the access procedure.

SAE Technical Standards included in the Collegiate Design Series (CDS) Rules

Baja SAE
J586 - Stop Lamps for Use on Motor Vehicles Less Than 2032 mm in Overall Width
J759 - Lighting Identification Code
J994 - Alarm - Backup – Electric Laboratory Tests
J1741 - Discriminating Back-Up Alarm Standard

Clean Snowmobile Challenge
J192 - Maximum Exterior Sound Level for Snowmobiles
J1161 - Sound Measurement – Off-Road Self-Propelled Work Machines Operator-Work Cycle

Formula SAE Hybrid
J1318 - Gaseous Discharge Warning Lamp for Authorized Emergency, Maintenance and Service Vehicles
J1673 - High Voltage Automotive Wiring Assembly Design

Formula SAE
SAE 4130 steel is referenced but no specific standard is identified
SAE Grade 5 bolts are required but no specific standard is identified

Supermileage
J586 - Stop Lamps for Use on Motor Vehicles Less Than 2032 mm in Overall Width

Electric Standards
SAE Standard J1673 - "High Voltage Automotive Assembly Wiring Design"
SAE J2344 - Guidelines for electric vehicle safety
Other Standards for use, e.g. EC
ISO_6469-part 1 - Electric road vehicles — Safety specifications: On board electrical storage
ISO_6469-part 2 - Electric road vehicles — Functional safety means and protection against failures
ISO_6469-part 3 - Electric road vehicles — Safety specifications: Protection of persons against electric hazards
IEC 61508 - Functional safety of electrical/electronic/programmable electronic safety-related systems

EN 12805 - "Automotive LPG Components - Containers"
EN 12979 - "Automotive LPG Systems - Installation Requirements"

EN 13856 - "Min Requirement for Content of the User Manual for Automotive LPG Systems"
EN 12806 - "Automotive LPG components - Other than Containers"
ECE Regulation No. 67 - Uniform Provisions Concerning:

I. Approval of Specific Equipment of Motor Vehicles Using Liquefied Petroleum Gases in Their Propulsion System
II. Approval of a Vehicle Fitted With Specific Equipment for the Use of Liquefied Petroleum Gases in Its Propulsion System With Regard To the Installation of Such Equipment

SAE Technical Standards for Supplemental Use

Standards Relevant to Baja SAE

J98 – Personal Protection for General Purpose Industrial Machines – Standard
J183 – Engine Oil Performance and Engine Service Classification - Standard
J306 – Automotive Gear Lubricant Viscosity Classification - Standard
J429 – Mechanical and Material Requirements for Externally Threaded Fasteners – Standard
J512 – Automotive Tube Fittings - Standard
J517 – Hydraulic Hose - Standard
J1166 – Sound Measurement – Off-Road Self-Propelled Work Machines Operator-Work Cycle
J1194 – Rollover Protective Structures (ROPS) for Wheeled Agricultural Tractors
J1362 – Graphical Symbols for Operator Controls and Displays on Off-Road Self-Propelled Work Machines - Standard
J1614 – Wiring Distribution Systems for Construction, Agricultural and Off-Road Work Machines
J1703 - Motor Vehicle Brake Fluid - Standard
J2030 – Heavy Duty Electrical Connector Performance Standard
J2402 – Road Vehicles – Symbols for Controls, Indicators and Tell-Tales – Standard

Standards Relevant to Formula SAE

J183 – Engine Oil Performance and Engine Service Classification - Standard
J306 – Automotive Gear Lubricant Viscosity Classification - Standard
J429 – Mechanical and Material Requirements for Externally Threaded Fasteners – Standard
J452 - General Information – Chemical Compositions, Mechanical and Physical Properties of SAE Aluminium Casting Alloys – Information Report
J512 – Automotive Tube Fittings - Standard
J517 – Hydraulic Hose - Standard
J637 – Automotive V-Belt Drives – Recommended Practice
J829 – Fuel Tank Filler Cap and Cap Retainer
J1153 - Hydraulic Cylinders for Motor Vehicle Brakes – Test Procedure
J1154 – Hydraulic Master Cylinders for Motor Vehicle Brakes - Performance Requirements - Standard
J1703 - Motor Vehicle Brake Fluid - Standard
J2045 – Performance Requirements for Fuel System Tubing Assemblies - Standard
J2053 – Brake Master Cylinder Plastic Reservoir Assembly for Road Vehicles – Standard

Standard Relevant to Formula Hybrid

J1772 – SAE Electric Vehicle and Plug in Hybrid Conductive Charge Coupler

Standard Relevant to all Collegiate Design Series Competitions

J1739 – Potential Failure Mode and Effects Analysis in Design (Design FMEA) Potential Failure Mode and Effects Analysis in Manufacturing and Assembly Processes (Process FMEA) and Potential Failure Mode and Effects Analysis for Machinery (Machinery FMEA)

ARTICLE 1: VEHICLE REQUIREMENTS & RESTRICTIONS – AS PER 2015 FSAE RULES

ARTICLE 2: GENERAL DESIGN REQUIREMENTS – AS PER 2015 FSAE RULES

ARTICLE 3: DRIVER'S CELL – AS PER 2015 FSAE RULES EXCEPT

T3.1.1 The impact attenuator will be assessed and graded information on the grading will be found on the FS website.

ARTICLE 4: COCKPIT – AS PER 2015 FSAE RULES

ARTICLE 5: DRIVERS EQUIPMENT (BELTS AND COCKPIT PADDING) – AS PER 2015 FSAE RULES

ARTICLE 6: GENERAL CHASSIS RULES – AS PER 2015 FSAE RULES EXCEPT

T6.3 Wheels

T6.3.3 Extended or composite wheel studs are prohibited

T6.4 Tyres

T6.4.3 Remoulded or re-treaded tyres are prohibited

ARTICLE 7: BRAKE SYSTEM – AS PER 2015 FSAE RULES EXCEPT

T7.2.1 The brake system will be dynamically tested and must demonstrate the capability of locking all four (4) wheels and stopping the vehicle in a straight line at the end of an acceleration run specified by the brake inspectors.

Note: Whilst at some point during the run all 4 wheels must be locked at the same time, it is acceptable for the front wheels to lock before the rear wheels.

T7.10.1 All brake fluid reservoirs must be shielded from the driver with an impermeable barrier which has a thickness of at least 0.5mm

ARTICLE 8: POWERTRAIN – AS PER 2015 FSAE RULES

ARTICLE 9: AERODYNAMIC DEVICES – AS PER 2015 FSAE RULES

ARTICLE 10: COMPRESSED GAS SYSTEMS AND HIGH PRESSURE HYDRAULICS – AS PER 2015 FSAE RULES EXCEPT

T10.3 Gaseous Fuel Systems

Any gas system on the vehicle that is used as a means of propulsion or energy source (e.g. to charge a battery through a fuel cell) must comply with the following requirements:

a. Working Gas -The working gas may be flammable, but only if it is to be burned or used for the sole means of propulsion of the vehicle.

b. Cylinder Certification- The gas cylinder/tank must be of proprietary manufacture, designed and built for the pressure being used, certified by an accredited testing laboratory in the country of its origin, and labelled or stamped appropriately. The following standard for composite cylinders applies: ISO11439 for hydrogen containers or NGV1 or ECE-R110 for natural gas, methane or similar gases. In accordance to cylinder standards, cylinders found

to have external defects such as abrasions or chemical corrosion must not be used.

c. Pressure Regulation- Where cylinders are interchangeable the pressure regulator must be mounted directly onto the gas cylinder/tank. If the vehicle is to be refuelled with the cylinder on-board the vehicle, the cylinder must be fitted with an internal solenoid, supplied by Dynetek or Teleflex GFI, this must be followed by an excess flow valve prior to fitting of a regulator. The inlet to the solenoid must be directly coupled to a check valve, with a cracking pressure no greater than 1 psi to ensure gas flow may only flow out of the cylinder via the regulator.

d. Protection – The gas cylinder/tank and lines must be protected from rollover, collision from any direction, or from damage resulting from the failure of rotating equipment. It is advised ECE-R110 documents are consulted for recommendations regarding the safe installation of gas systems.

e. Cylinder Location- The gas cylinder/tank and the pressure regulator must be located either rearward of the Main Roll Hoop and within the envelope defined by the Main Roll Hoop and the Frame (see B.3.2), or in a structural side-pod that meets the requirements of B.3.24 or B.3.31. It must not be located in the cockpit.

f. Cylinder Mounting- The gas cylinder/tank must be securely mounted to the Frame, engine or transmission.

g. Cylinder Axis- The axis of the gas cylinder/tank must not point at the driver.

h. Insulation- The gas cylinder/tank must be insulated from any heat sources, e.g. the exhaust system.

i. Lines and Fittings- The gas lines and fittings must be appropriate for the maximum possible operating pressure of the system and must be assembled according to manufacturer's recommendations. As part of the *safety form and FMEA*, for gas systems teams must:

- Provide gas system diagrams.
- Provide details of all components used in the system so that they can be approved by the rules committee. (These can be approved prior to submission of the safety documents if required)
- Provide details of proof testing for pressurisation of the whole system to working pressure in addition to a leak test on all fittings. (If the testing is not conducted before the safety documentation is submitted then this information must be available at scrutineering).
- Demonstrate single failure tolerant design; other than the tank and gas lines, the system must be capable of containing the gas in the event that any failure occurs in any one component. Where reasonably possible a component failure should cause the fuel solenoid to close. Teams must be able to demonstrate how to identify whether a component functions correctly or not.

j. The maximum allowable storage pressure is 350 bar.

k. All gas cylinders, regulators, solenoid valves and other equipment exposed to pressurized gas must be appropriately certified for use with the gas being used and the pressure that they are being used at.

l. Where vehicle refuelling is to be carried out onsite the following cylinder connections are to be used:

-350 bar hydrogen: SAE J2600-H35 and ISO 17268

-200 bar CNG: ISO 14469

m. Ventilation- any leaked gas should be able to freely dissipate without pockets of gas accumulating. Gas detection systems must be placed in the most likely escape paths for gas, but should not create an obstacle to the escaping gas.

ARTICLE 11: FASTENERS – AS PER 2015 FSAE RULES

ARTICLE 12: TRANSPONDERS – AS PER 2015 FSAE RULES

ARTICLE 13: VEHICLE IDENTIFICATION – AS PER 2015 FSAE RULES EXCEPT

T13.1 Car Number

T13.1.1 Each team will select an available number at the time of its entry into Formula Student. Car numbers 1-10 are reserved for the top 10 overall finishers at FS2013.

T13.1.2 Car numbers must appear on the vehicle as follows:
Locations: In three (3) locations: the **front** and both **sides**;

a. Height: At least 152.4 mm (6 inch) high;
b. Font: Block numbers (i.e. sans-serif characters). Italic, outline, serif, shadow, or cursive numbers are prohibited.
c. Stroke Width and Spacing between Numbers: At least 18 mm (3/4 inch).
d. Colour: Either white numbers on a black background or black numbers on a white background. No other colour combinations will be approved.
e. Background shape: The number background must be one of the following: round, oval, square or rectangular. There must be at least 25.4 mm (1 inch) between the edge of the numbers and the edge of the background.
f. Clear: The numbers must not be obscured by parts of the car, e.g. wheels, side pods, exhaust system, etc.

T13.1.3 Car numbers for teams registered for North American FSAE competitions can be found on the "Registered Teams" section of the relevant Formula SAE website.

Comment: Car numbers must be quickly read by course marshals when your car is moving at speed. Make your numbers easy to see and easy to read.

Example:

T13.1.4 Any car which uses electrical energy as a means of propulsion must use a light green background for the numbers. Note: it is not necessary to have a letter E before the number.

T13.1.5 Any car which uses a gaseous fuel must use an orange background for the numbers

T13.3 Formula Student Logo

Each car will be required to append three (3) Formula Student logos, 20 cm x 15 cm. One (1) marking to the front end of the nose of the car and one (1) on each side panel, ideally above the race number plate or within the top third of the side panels, (these will be supplied by the organisers). No sponsor or other markings will be permitted to encroach on these areas. A document showing the requirements can be found here: http://events.imeche.org/docs/fs2013-docs/formula-student-vehicle-identification.pdf?sfvrsn=0

Alternatively, teams may incorporate the Formula Student logo into their own colour/graphics schemes, in any of the permitted colour options, providing the logo meets the size and location requirements above and does not breach the Institution Brand Guidelines – see the Formula Student Website. The logo is available in various formats on the Use of Logos webpage.

T13.4 Technical Inspection Sticker Space

T13.4.1 Technical inspection stickers will be placed on the upper nose of the vehicle. Cars must have a clear and unobstructed area at least 125 mm diameter on the upper front surface of the nose along the vehicle centreline, which will be used to record the car weight and identify the sections of scrutineering that have been completed.

T13.4.2 Vehicles that are being entered into multiple competitions in the FSAE series must allow sufficient space along the nose centreline for all inspection stickers.

T13.4.3 Each car will be required to append a sticker on the car 8cm x 8cm, which identifies which drivers have completed which event. The location of the sticker must be on *the left hand side of the car above 350mm from the* ground such that the marshals can record the driver's letter on the sticker at each event.

ARTICLE 14: EQUIPMENT REQUIREMENTS – AS PER 2015 FSAE RULES EXCEPT

T14.2 Helmet

A well-fitting, closed face helmet that meets one of the following certifications and is labelled as such:

- Snell SA2000, SA2005, SA2010
- SFI 31.2A, SFI 31.1/2005
- FIA 8860-2004, *FIA 8860-2010*
- British Standards Institution BS 6658-85 Type A/FR rating (Types A and B are not accepted)

Non-UK teams may also use helmets that comply with their own sanctioning body, but these helmets must also be permitted by the FSAE Rules. Approval for use of alternative helmets to those listed above must be sought from formulastudent@imeche.org. Note: the reference number in the helmet must be included.

Open faced helmets are not approved.

All helmets to be used in the competition must be presented during Technical Inspection where approved helmets will be stickered. The organiser reserves the right to impound all non-approved helmets until the end of the competition.

T14.5 Suit

The Driver's suit must comply with FIA 8856-2000. Non-UK teams may also use driver's suits that comply with their own sanctioning body, but these driver suits must also be permitted by the FSAE Rules. Use of alternative driver's suits to those listed above must be sought from formulastudent@imeche.org. Note: a scan of the suit label must be supplied with the submission.

T14.5.1 Official Race Suit Patches

To be eligible to claim points in dynamic events, drivers must carry the relevant Formula Student patch or other patches as specified by the organisers, on their race suit. This will be checked at Technical Inspection. The Formula Student patch will be issued at onsite registration. The dimensions are: 10cm wide by 8cm high. The patch

must be positioned on the upper chest area of the race suit. Please see the Formula Student Website.

ARTICLE 15: POSSIBLE FUTURE RULES CHANGES – AS PER 2015 FSAE RULES

APPENDIX T-1 STRUCTURAL EQUIVALENCY SPREADSHEET

Appendix T-1 is posted at http://www.formulastudent.com/formula-student/Teams/forms

APPENDIX T-2 IMPACT ATTENUATOR DATA REPORT

Appendix T-2 is posted at http://www.formulastudent.com/formula-student/Teams/forms

NOTE: Guidelines on how the report is marked will be put on the Formula Student Website

PART AF - ALTERNATIVE FRAME RULES

ARTICLE 1: AF RULES AND FORMULA STUDENT

Formula Student will not accept entries complying with the AF rules unless they have been approved by other competitions

2015 FORMULA STUDENT RULES

PART IC - INTERNAL COMBUSTION ENGINE VEHICLES

ARTICLE 1: INTERNAL COMBUSTION ENGINE POWERTRAINS – AS PER 2015 FSAE RULES EXCEPT

IC1.5 Throttle and Throttle Actuation
Note: It must be possible to inspect both throttle springs without disassembling the throttle body

IC1.6 Intake System Restrictor
Note: For alternative fuels, please contact Formula Student for restrictor sizes

IC1.7 Turbochargers and Superchargers
Note: In addition to the FSAE rules, please see the clarification: http://www.fsaeonline.com/

ARTICLE 2: FUEL AND FUEL SYSTEM – AS PER 2015 FSAE RULES EXCEPT

IC2.1 Fuel
The basic fuel available at competitions in the Formula SAE Series is unleaded gasoline. For the FSAE North American competitions this should have an octane rating of 91 (R+M)/2 (approximately 95 RON) minimum and for other competitions, the unleaded gasoline that will be available will be published by the relevant organizing committee. However, the basic fuel may be changed at the discretion of the organizing body. Other fuels may be available at the discretion of the organizing body.

ARTICLE 3: EXHAUST SYSTEM AND NOISE CONTROL – AS PER 2015 FSAE RULES EXCEPT

IC3.1 Exhaust System General

IC3.1.4 The use of rubber mounts directly between the exhaust and exhaust clamp is prohibited for both the exhaust and silencer.

ARTICLE 4: ELECTRICAL SYSTEM AND SHUTDOWN SYSTEM – AS PER 2015 FSAE RULES

Note: Please see the clarification: http://www.fsaeonline.com/

ARTICLE 5: ALTERNATIVE FUELS AND POWERTRAINS – FORMULA STUDENT ONLY

IC5.1 Alternative Fuels and Powertrains Overview
Formula student would like to promote alternative powertrains and fuels such that vehicles built with alternative powertrains can compete fairly at the competition. In the past Formula Student has accepted entries of Fuel Cell vehicles with super-capacitor accumulators and combustion engines that use Hydrogen gas and Compressed Natural Gas (CNG). If a team wishes to use an alternative fuel then the process in A.1.6.1 must be followed.

There are additional rules for alternative fuels. It will be necessary to work with the Formula Student Technical Committee to develop a satisfactory design; however some of the additional rules are as follows:

IC5.2 Fuel

For alternative powertrains, in addition to the fuel that is available cars built to the FSAE rules, the organisers will seek to secure the supply of appropriate fuels to support alternative powertrains but this cannot currently be guaranteed.

Entrants requiring alternative fuels should have a back-up plan in mind for fuel supply.

IC5.3 Location of Fuel System

Any fuel, compressed gasses, other energy storage media must be contained within the primary structure of the frame and when located less than 350mm from the ground must be protected from side or rear impacts with a structure built to Rule T3.25 or T3.34 as applicable.

IC5.4 Engine Limitations

IC5.4.1 If a liquid or gaseous fuel burning engine is fitted it must be an Internal Combustion, four-stroke piston engine with a maximum displacement of 610cc.

IC5.4.2 The engine can be modified within the restrictions of the rules.

IC5.4.3 If more than one engine is used, the total displacement cannot exceed the maximum displacement described in IC1.1.1 and the air for all engines must pass through a single air intake restrictor (see IC1.6, "Intake System Restrictor.")

IC5.4.4 Hybrid powertrains utilizing on-board energy storage are allowed.

IC5.4.5 Electric only or hybrid vehicles which use Electric as there prime means of propulsion e.g. electric / hydraulic and series hybrids as well as parallel hybrids are allowed.

IC5.4.6 Any electric hybrid vehicles must follow the EV regulations for the Electrical System unless a change is agreed with the Formula Student Technical Committee

IC5.4.7 If more than one engine is used, the intake air for all engines must pass through the one restrictor

IC5.4.8 Any car using a diesel engine must incorporate a throttle which is mechanically closed when the throttle pedal is released.

IC5.4.9 Any car which is not solely powered by either petrol or E-85 may use electronic throttle control (ETC) or "drive-by-wire" systems to control the power that is delivered to the wheels, however the design must comply with regulations IC1.11 – IC1.18.

The principle of the newly introduced Electric Vehicle part is to allow the development of fully electric vehicles within the FSAE framework. These rules are based on the electric vehicle regulations developed by Formula Student and Formula Student Germany, and also include elements of the Formula Hybrid Rules.

ARTICLE 1: ELECTRIC SYSTEM DEFINITIONS – AS PER 2015 FSAE RULES

ARTICLE 2: ELECTRIC POWERTRAIN – AS PER 2015 FSAE RULES EXCEPT

EV2.2 Power and Voltage Limitation

EV2.2.1 *The maximum power drawn from the battery must not exceed 80kW for Two (2) Wheel Drive Vehicles and 60kW for Four (4) Wheel Drive Vehicles. This is referred to as the power limit and will be checked by evaluating the Energy Meter data*.

EV2.2.2 The maximum voltage in the tractive system must not exceed the voltage defined in EV1.1.2. This will be checked by evaluating the Energy Meter data.

EV2.2.3 Violating these values will lead to disqualification for the entire dynamic event in which the violation occurred e.g. if a violation occurs during one single acceleration run, the team will be disqualified for the complete acceleration event.

EV2.2.4 *A violation is defined as using more than the respective power limit or exceeding the specified voltage for more than 100ms continuously or using more than the respective power limit or exceeding the specified voltage, after a moving average over 500ms is applied*.

EV2.2.5 The respective data of each run in which a team has drawn more than the respective power limit from the battery or where the maximum permitted voltage is exceeded and the resulting decision will be made public.

EV2.2.6 Non-availability of Energy Meter data due to the team's fault will be treated as a violation.

EV2.2.7 Regenerating energy is allowed and unrestricted but only when the vehicle speed is > 5kph. It is not allowed at vehicle speeds <= 5kph.

EV2.2.8 Supplying power to the motor such that the car is driven in reverse is prohibited.

ARTICLE 3: TRACTIVE SYSTEM - ENERGY STORAGE – AS PER 2015 FSAE RULES

ARTICLE 4: TRACTIVE SYSTEM – GENERAL REQUIREMENTS – AS PER 2015 FSAE RULES

ARTICLE 5: SHUTDOWN CIRCUIT AND SYSTEMS – AS PER 2015 FSAE RULES

ARTICLE 6: FUSING – AS PER 2015 FSAE RULES

ARTICLE 7: ELECTRICAL SYSTEM TESTS – AS PER 2015 FSAE RULES

ARTICLE 8: HIGH VOLTAGE PROCEDURES & TOOLS – AS PER 2015 FSAE RULES

ARTICLE 9: ELECTRICAL SYSTEM FORM AND FMEA – AS PER 2015 FSAE RULES

2015 FORMULA SAE
PART S - STATIC EVENT REGULATIONS

ARTICLE 1: STATIC EVENTS AND MAXIMUM SCORES – AS PER 2015 FSAE RULES

The maximum possible scores in the static events are:

Technical Inspection	No Points
Cost, Manufacturing and Sustainability	100 Points
Business Presentation	75 Points
Design	150 Points
Total	325 Points

ARTICLE 2: TECHNICAL INSPECTION – AS PER 2015 FSAE RULES EXCEPT

The order of the Technical Inspection Queue will be defined based on completion of a technical inspection spreadsheet and accompanying photographs which will be submitted via the competition website prior to the competition. Queue numbers will be assigned in the order which the spreadsheet including photos are submitted. The temple will be provided on the Formula Student website:

ARTICLE 3: BUSINESS LOGIC CASE – AS PER 2015 FSAE RULES

ARTICLE 4: COST, MANUFACTURING AND SUSTAINABILITY EVENT

Important Notice: Additional information about the Cost, Manufacturing and Sustainability Event including Cost Tables and other information can be obtained from the www.fsaeonline.com website which is also linked off the Formula SAE Rules and Important Documents page on the FSAE Website.

S4.1 Event Objective

The objectives of the Cost, Manufacturing and Sustainability Event are in addition to the FSAE Cost event rules:

a. To teach the participants that environmental impact is a significant factor that must be considered in any engineering exercise, particularly at the design stage.
b. For teams to make trade off decisions between the performance advantage and environmental impact of the powertrain.

S4.2 Rules Objective

The objectives of the Cost, Manufacturing and Sustainability Event rules are in addition to the FSAE Cost event rules:

a. To improve fairness by providing consistent guidelines independent of teams' geographical location by using standardized material Eco data tables.
b. To require the minimal burden of supporting documentation such as material suppliers environmental data sheets. However, in some cases there may be unusual materials used in components such as batteries, ultra-capacitors, fuel cells and composites that are not covered in the standard tables. In this case participants are encouraged to source the relevant embodied energy and CO_2 information directly from the suppliers wherever possible and forward it to Formula Student Rules Committee for approval and inclusion in the materials database.

S4.3 Event Requirements – As per FSAE 2015 rules except

This event is comprised of three (3) parts

S4.3.1 Part 1 "Cost Report"
The preparation and submission of a report (the "Cost, Manufacturing and Sustainability Report"), which is to be sent to the Cost Judges prior to the competition. This may be in the form of online submission; teams should check the IMechE FS website prior to the deadline. See S4.8

S4.3.2 Part 2 "Discussion"
A discussion at the Competition with the Cost Judges around the team's vehicle. See Section S4.3.2. This evaluates not only the cost of the car, and sustainability assessment of the vehicle, but also the team's ability to prepare accurate engineering and manufacturing cost estimates.

S4.3.3 Part 3 "Real Case"
A "real case" scenario where students will have to respond to a challenge related to cost or manufacturing of the student vehicle.

S4.4 Formula SAE Michigan & Formula SAE Lincoln Reports – Not Applicable

S4.5 Public Cost Reports
By submitting a cost report to the competition's organizing body for judging you and your team agree that your cost report can be reproduced and distributed by the competition organization, in both complete and edited versions, in any medium or format anywhere in the world.

Note: For the 2015 competition season it is the plan of the FSAE Rules Committee and the competition organisers to publish all cost reports, in as-submitted format, to the FSAE website. It is the intent of this move to make the cost event more transparent and improve the educational experience of the students by providing the full range of cost reports for teams to review. Cost reports for that competition season will not be published before the end of the calendar year. Support materials, such as technical drawings, will not be released.

S4.6 Definitions
The following definitions will apply throughout the Cost, Manufacturing and Sustainability Event rules:
S4.6.1 to S4.6.25 as per FSAE 2015 rules

S4.6.26 Eco data – Data relating to the properties of a material which have an impact upon the surrounding environment during its production, use and disposal, such as embodied energy/CO_2, toxicity, biodegradable, renewable etc.

S4.6.27 Eco-Design – The process by which items are designed for minimum environmental impact by careful consideration of form and materials selection.

S4.6.28 Environmental Impact – The environmental impact for each item is simply the mass of the constituent materials that make up that item multiplied by the unit energy and CO_2 values for those materials from the Sustainability Materials List.

S4.6.29 Initial Environmental Impact – The environmental impact of the vehicles powertrain submitted for initial judging in the Cost and Sustainability Report.

S4.7 General Requirements
S4.7.1 The Cost, Manufacturing and Sustainability Report must:

a. Use the standardised Cost and Sustainability Tables. The tables are designed to reflect a hypothetical car built for production at the annual volume of 1000 units per year.
b. List and cost every part on the prototype vehicle. This includes any equipment fitted on the vehicle at any time during the competition. The only exceptions are that, per S.3.22 "Cost Report Exempt Items" of the Rules, the cost of any finish, on-board fire suppression system, rain tires, video or radio system, does not need to be included in the Cost, Manufacturing & Sustainability Report.
c. Be based on the estimated costs of materials, fabrication, purchased parts, and assembly of the car. The costs shall be calculated as defined in these rules.
d. Be based on the actual manufacturing technique used on the prototype, e.g. cast parts on the prototype must be cost as cast, and fabricated parts as fabricated, etc.
e. Include tooling (e.g. welding jigs, moulds, patterns and dies) for processes requiring it.
f. Exclude R & D and capital expenditures (e.g. plant, machinery, hand tools and power tools).

Note: There is no maximum cost. Receipts are not required for any items.

S4.7.2 The Cost Tables have been designed to:
a. Be verifiable at the event. Differentiating between different types of materials (for example different alloys of steel) is not possible so no differentiation is made in the table cost.
b. Minimize influence on safety equipment content. For example driver harnesses are cost independent of the style chosen.
c. Higher costs of some goods must reflect actually higher value of those goods. However, the costs must still allow for team innovation and vehicle content, with some reduction in cost score.
d. Include net weight for powertrain components and as accurate a possible a split for the subsequent materials
e. For combustion engines, typical data will be provided in the data tables

S4.8 Scoring

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

20x[(Pmax)/(Pyour)-1] **[(Pmax)/Pmin)-1]**	20	Lowest cost - each of the participating schools will be ranked by total adjusted cost from the BOM and given 0-20 points based on the formula on the left.
Accuracy, Clarity & Event Day/Visual Inspection	40	-The cars will be reviewed for part content, manufacturing feasibility and accuracy of the cost information. Supporting documentation will be assessed based on its quality, accuracy and thoroughness. The range for the score is 0-40 points. - Consideration for sustainability via event presentation. Teams should present how they have made their powertrain selection, for example, but not limited to, material, process, and technology, efficiency.

Event Day/Manufacturing Processes	20	-The teams must be prepared to discuss in detail the "real case" scenario distributed prior to the competition. The materials will include more specifics about the goal and scoring of the scenario. The range for the score is 0-20 points.
Cost Final	20	-Teams scores from the above 3 sections will determine a final group eligible for assessment in a cost final for an additional maximum 20 points.
Total	100 Points	

Where:

Pyour is the adjusted cost of your car (with penalties) in dollars.
Pmin is the adjusted cost of the lowest cost car in dollars.
Pmax is the cost of the highest cost car in dollars.

S4.9 Cost and Manufacturing Report

S4.9.1 The Cost and Manufacturing report consists of a full vehicle BOM with cost data derived from the Cost Tables and supporting documentation. The Cost and Manufacturing Report must be submitted in two (2) forms: (MANDATORY REQUIREMENTS)

1. **Electronic Version** - (Uploaded to IMechE FS UK website in team area)
   See event deadlines and submissions for details.
   a. The electronic "FSAE eBOM" must be identified as follows: Carnumber_schoolname_CR_eBOM.xlsx using the assigned car number and the complete school name. Example: 500_University of FSAE_CR_eBOM.xlsx
   b. "FCA Inputs Sheet" for all manufactured components
      i. Ensure these are linked sheets to the eBOM.
   c. Manufacturing technical 2d Drawings.
      i. Where components are manufactured, these are required.

2. **Hard Copy** - (Brought to the event)
   The hard copy Cost, Manufacturing and Sustainability Report must be in a ring binder with A4 pages, and no more than 1 folder

S4.9.2 Cost and Manufacturing Report Identification

The cover of the Cost and Manufacturing Report must include the following:
a. university name,
b. competition name, and
c. Vehicle number.

S4.9.3 The Cost and Manufacturing Report must consist of the following:

- A Cover sheet
- A Table of Contents
- A Cost Summary page listing each section's cost, and the total vehicle cost
- Eight commodity report sections with the parts placed in the sections as specified in FSAE rules Appendix S-3.
- Tabs for each section

Note: Teams entered into a competition using the Cost Application (See S4.24) should still include the items above but the cost summary pages can be printed directly from the application.

S4.9.4 Scoring and judging of the sustainability element of the competition will be split into to two areas to achieve the maximum 20 points.

1. Firstly each of the 8 vehicle subsections will be assessed for considerations to sustainability, and how the team have incorporated this into their design during the event judging. Teams should present at the judges request, the balance of cost, manufacturing and sustainability, and how they achieved the optimal mix to meet the event criteria, and objective.
2. Secondly, a presentation at the event (not submitted prior) on the rational for powertrain selection (Electric vs. Combustion etc.), demonstrating the sustainable impact as a result of that decision. This should also consider cost and manufacturing, as well as life cycle impact. Teams should include the sustainability analysis table (available via the IMechE FS UK website), and evaluate the data for their particular design, as well as alternatives. There is no limit to the detail a team can provide for this, but they should present a strong case as to the decisions they have made.

S4.10 Bill of Materials (BOM) – as per 2015 FSAE Rules

S4.11 The Cost Tables – as per 2015 FSAE Rules except with the following additions

S4.11.8 All environmental impact figures in the Sustainability section of the Report come from the standardised Sustainability Materials List. This list has been compiled to represent the average embodied energy and CO_2 values for raw materials and a limited number of bought-in components used in the manufacture of the vehicle.

S4.11.9 It should be noted that the Eco data provided is not precise in the same sense as other technical material properties such as stiffness and strength. Eco data is by its nature both regional and subject to variation over time as technology for material extraction and processing evolves. The figures quoted are the mean of available data where the max-min may be a variation of +- 25%.

S4.11.10 Requests to alter the embodied energy and CO_2 values of materials in the list because of changing technologies and processes will not be approved. The list is intended to provide a fair, unchanging (within a given competition year) environmental impact for materials and to reduce regional variations that may help or hurt certain teams. All teams must use the embodied energy and CO_2 values given in the list. If a team wishes to use any materials not included in the FSAE material, process or fasteners list an "Add Material Request" must be submitted to the Formula Student Rules Committee, via the FS Questions Database and eAIR (FSAE) (A10.6.5)

S4.11.11 The list represents embodied energy and CO_2 based on material mass.

S4.12 Cost Models & Costing Methodology – as per 2015 FSAE Rules

S4.13 Make Versus Buy – as per 2015 FSAE Rules

S4.14 Add Item Request – as per 2015 FSAE Rules

S4.15 Report Submission and Deadline – as per 2015 FSAE Rules

S4.16 Late Submission of Cost Report – as per 2015 FSAE Rules

S4.17 Addenda – as per 2015 FSAE Rules

S4.18 Cost Report Judging and Penalties Process – as per 2015 FSAE Rules except

S4.18.3 Any error that results in a team over reporting a cost in their Cost, Manufacturing and Sustainability Report will not be further penalised. For example, when the Cost, Manufacturing and Sustainability Report is prepared the thickness of the brake rotors has not yet been determined. The team conservatively costs the rotors as 10mm thick. The final thickness is 8mm and no change is made in the addendum. The team rotor price is higher than necessary but no penalty is applied.

Note: The penalty system is intended to reward accuracy and minimise workload at the competition for students and judges. In most cases the standard point's deductions will be made to the accuracy score.

Note: Any instance where a team's score benefits by an intentional or unintentional error on the part of the students will be corrected on a case by case basis.

S4.19 Penalty Method A- Fixed Point Deductions – as per 2015 FSAE Rules

S4.20 Penalty Method B – Adjusted Cost Deductions – as per 2015 FSAE Rules

S4.21 Penalty Calculation Example

For example the pneumatic shifter was inadvertently left off the Cost, Manufacturing and Sustainability Report. As this is an assembly the standard error is 5 points. The cost of all air shifter parts and processes from the Cost Tables is $500. This means the total penalty cost is $1000. To see which is greater, 5 points or $1000, the dollar penalty needs to be converted to points by reference to the Cost Points formula:

$$\text{Points} = 20x\left[\frac{(Pmax)}{(Pyour)}-1\right]\left[\frac{(Pmax)}{Pmin}-1\right]$$

Substitute the cost of the vehicle (Pyour) with $15,000 while the minimum vehicle cost (Pmin) was $10,000. The maximum vehicle cost (Pmax) was $50,000. Calculating the point's equivalent for this dollar amount yields 2.5 points. This is less than the standard penalty. In this case the 5 points would be deducted from the Accuracy score.
If the team had made many small errors and had no more accuracy points available then the $1000 would be added to the team's adjusted cost.

S4.22 Discussion at the Competition

S4.22.1 At this discussion, the Cost Judges will:

a. Review whether the specification of the vehicle in the Cost, Manufacturing and Sustainability Report accurately reflects the vehicle brought to the Competition
b. Review the manufacturing feasibility of the vehicle
c. Assess penalties for missing or incorrect information in the Cost, Manufacturing and Sustainability Report compared to the vehicle presented at inspection.
d. Assess the students understanding, concept and reasoning for the chosen powertrain, and their presentation competence of the subject matter.

S4.22.2 The team must present their vehicle at the designated time to the Cost Judges for review of the Cost, Manufacturing and Sustainability Report. Teams that miss their

cost appointment will potentially lose all cost points for that day. The schedule for these appointments will be in the registration packets and/or posted on the website.

S4.23 Cost Manufacturing & Sustainability Report Exempt Items – as per 2015 FSAE Rules

S4.24 Exchange Rates & Unit Systems – as per 2015 FSAE Rules

ARTICLE 5: BUSINESS PRESENTATION EVENT

S5.1 Business Presentation Event Objective – Business Case

S5.1.1 The objective of the presentation event is to evaluate the team's ability to develop and deliver a comprehensive business case that will convince the executives of a corporation that the team's design best meets the demands of the amateur, weekend competition market, and that it can be profitably manufactured and marketed. (See also A1.2)

Teams are not required to assume a production rate of 1000 cars per year. It is open to teams to suggest their manufacturing volume / production rate targets, which should be based upon the published market data provided in the Business Logic Case (BLC) template. The BLC published market data defines the attainable sales volume based upon selling price, and its purpose is to provide common data for all teams. The important element is that teams demonstrate the logic behind their assumption / proposal and are also able to demonstrate that it can support a viable business model for both parties.

S5.1.2 The business presentation event is a role play and teams should present themselves as employees of a company rather than as students. The judges should be treated as if they were executives of a corporation interested in either manufacturing your design or investing in your company. Teams should approach the event with a view to obtaining a business deal to manufacture and sell the team's car.

S5.1.3 Teams should assume that the "executives" represent different areas of a corporate organization, including engineering, production, marketing and finance, and thus may not all be engineers.

S5.1.4 Presentations will be evaluated on the contents, organization and visual aids as well as the presenters' delivery and the team's response to questions.

S5.1.5 The presentation must relate to the car entered into the competition and although the actual quality of the prototype itself will not be considered as part of the presentation judging, the presentation must be consistent with the Business Logic Case that is submitted prior to the competition.

S5.2 Business Presentation Schedule

S5.2.1 At Formula Student the Class 1 Business Plan Presentation Judging will consist of two parts:

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

S5.2.2 Initial judging of Business Presentations will be made on the static events days. Presentation times will be scheduled by the organisers and either, or both, posted in advance on the competition website or released during on-site registration.

S5.2.3 Teams that fail to make their presentation during their assigned time period will receive zero (0) points for the event. Teams arriving more than eleven (11) minutes late to their assigned judging team will be deemed to have missed their assigned time period.

S5.2.4 Final judging of the top 3-5 teams will take place during the Business Presentation Final. Qualifying teams will be provided with their allocated times in advance of the final.

S5.3 Business Presentation Format

S5.3.1 One or more team members will give the presentation to the judges.

S5.3.2 All team members who will give any part of the presentation, or who will respond to the judges' questions, must be in the podium area when the presentation starts and must be introduced to the judges. Team members who are part of this "presentation group" may answer the judge's questions even if they did not speak during the presentation itself.

S5.3.3 Presentations are limited to a maximum of ten (10) minutes. Penalties will be imposed if the presentation exceeds 11 minutes or if the presentation is excessively short in duration. Teams will be asked to rapidly conclude their presentation if they overrun significantly.

S5.3.4 The presentation itself will not be interrupted by questions. Immediately following the presentation there will be a question and answer session of up to five (5) minutes.

S5.3.5 Only judges may ask questions. Only team members who are part of the "presentation group" may answer the judges' questions.

S5.3.6 For the convenience of the Business Presentation Event judges, in all Classes, teams giving a PowerPoint or similar style presentation are required to hand a paper copy of their slides, preferably in colour, to the judges at the end of the Question and Answer session. Judges will also arrange for an electronic copy of the presentation to be loaded onto a USB device.

S5.3.7 The format of the final judging will be the same as for the initial judging including Questions & Answers. The "presentation group" for the final must consist of the same team members as the initial judging.

S5.4 Data Projection Equipment

S5.4.1 LCD / Plasma TV-style screens will be provided by the organisers (no OHPs will be provided), but teams should bring their own laptop computers and may use their own projectors if they wish. The screens will have VGA Input Connectors. Teams are responsible for the compatibility of their computer equipment and setting up of the screens. Overseas teams should ensure they have UK compatible power leads/adaptors.

S5.5 Evaluation Criteria

S5.5.1 The scoring criteria differs slightly from the FSAE scoring with additional weighting given to Content (40% of the marks are allocated to Content; the remaining marks are equally allocated to Organisation, Visual Aids, Delivery and Q&A). The detailed scoring sheet is not published but the broad topics are in line with the standard FSAE scoring sheet.

The Business Presentation should also briefly address the environmental credentials of the project and proposed vehicle. This will be assessed under the 'Content' section of the Business Presentation. This is not to be confused with the Sustainability static event and its associated presentation.

S5.5.2 The criteria are applied only to the team's presentation itself. The team that makes the best presentation, regardless of the quality of their car, will win the event.

S5.6 Scoring Formula

S5.6.1 There is a maximum of seventy-five (75) points from the Business Presentation event.

Non Finalist:

S5.6.2 The Business Presentation scores for non-finalists will be normalised such that the highest scoring presentation scores seventy (70) points towards the overall competition score, and all other teams will be awarded points on a pro-rata basis.

BUSINESS PRESENTATION SCORE = 70 x Pyour/Pmax

Where:
"Pmax" is the highest score awarded to any team not participating in the final and
"Pyour" is the score awarded to your team

Finalists:

S5.6.3 Between 3 and 5 teams will be selected to participate in the Business Presentation final. The number of teams invited to participate in the final is at the discretion of the Business Presentation Event Captain and will not be eligible for appeal. Points will be allocated to finalists on the following basis:

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

S5.6.4 It is intended that the scores will range from near zero (0) to seventy-five (75) to provide good separation.

S5.6.5 The Business Presentation Event Captain may at his/her discretion; normalize the scores of different judging teams.

S5.7 Business Presentations without a Completed Car

Class 1 Teams that are unable to bring a vehicle to the competition may participate in the Business Presentation Event and will receive a score for that event.

Note: Participating in the Presentation event without bringing a vehicle to the competition will not affect the status of the car you have under construction at your school. When you finish it and bring it to a competition it will still be a first year vehicle under Rules A6.6 and A6.8

Note: Class 2 entries, by definition, do not have a completed car. It is recognised that the technical aspects of their project may still be developing, but the judges will

expect a sound business proposal, which is expected to be in line with the Business Logic Case (BLC).

ARTICLE 6: DESIGN EVENT

S6.1 Design Event Objective

S6.1.1 The concept of the design event is to evaluate the engineering effort that went into the design of the car and how the engineering meets the intent of the market *both in terms of vehicle performance and overall value*.

S6.1.2 The car that illustrates the best use of engineering to meet the design goals, *a cost effective high performance autocross car*, and the best understanding of the design by the team members will win the design event.

Comment: Teams are reminded that this is an engineering design competition and that in the Design Event; teams are evaluated on their design with respect to the objectives set in the Rules. Components and systems that are incorporated into the design as finished items are not evaluated as a student designed unit, but are only assessed on the team's selection and application of that unit. For example, teams that design and fabricate their own shocks are evaluated on the shock design itself as well as the shock's application within the suspension system. Teams using commercially available shocks are evaluated only on selection and application within the suspension system.

S6.1.3 The design judges may also consult the Business Logic Case that is submitted before the event. It is expected that the car that is presented at the Design Event should reflect the design concept that is shown in the Business Logic Case.

S6.2 Design Report – Required Submission

S6.2.1 Design Report - Judging will start with a Design Review before the event. The principal document submitted for Design Judging is the Design Report.

S6.2.2 The Design Report must not exceed eight (8) pages, consisting of not more than four (4) pages of text, three (3) pages of drawings (see S6.4, "Vehicle Drawings") and one (1) optional page containing content to be defined by the team (photo's, graphs, etc…).

S6.2.3 The document should contain a brief description of the vehicle with a review of your team's design objectives, analysis of how your solution best meets the challenges set by the Rules, a discussion of any important design features and vehicle concepts. Include a list of different analysis and testing techniques (FEA, dynamometer testing, etc.). Evidence of this analysis and back-up data should be brought to the competition and be available, on request, for review by the judges.

S6.2.4 These documents will be used by the judges to sort teams into the appropriate design groups based on the quality of their review.

Comment: Consider your Design Report to be the "resume of your car".

S6.3 Design Spec Sheet – Required Submission

S6.3.1 Design Spec Sheet – A completed FSAE Design Spec Sheet must be submitted.

S6.3.2 The FSAE Design Spec Sheet template can be found at http://www.formulastudent.com/formula-student/Teams/forms. Do not alter or re-format the template prior to submission.

S6.3.3 The design judges realize that final design refinements and vehicle development may cause the submitted figures to diverge slightly from those of the completed vehicle. For specifications that are subject to tuning, an anticipated range of values may be appropriate.

S6.3.4 The Design Report and the Design Spec Sheet, while related, are independent documents and must be submitted as two (2) separate files,

S6.4 Vehicle Drawings

S6.4.1 The Design Report must include one set of three (3) view drawings showing the vehicle, from the front, top, and side.

S6.4.2 Each drawing shall appear on a separate page. The drawings can be manual or computer generated.

S6.4.3 Photos should be placed on the optional page and will not be counted as drawings. Teams are reminded that the purpose of the inclusion of the drawing views is to convey useful engineering information. A rendering of the bodywork is likely to be viewed as an incomplete drawing.

S6.5 Design Report and Design Spec Sheet Formats

S6.5.1 The Design Report must be submitted electronically in Adobe Acrobat® Format (*.pdf file). This document must be a single file (text, drawings, and optional content all inclusive). The file upload system may assign filenames automatically but you should check carefully that yours is correct: do not leave it to the last minute.

S6.5.2 The Design Report file must be named as follows: carnumber_schoolname.pdf using the FSAE assigned car number and the complete school name, e.g. 001_University of SAE.pdf

S6.5.3 Design Spec Sheets must be submitted electronically in Microsoft Excel® Format (*.xls or *.xlsx file). The format of the Spec Sheet MUST NOT be altered.

S6.5.4 Similar to the Design Report, the Design Spec Sheet file must be named as follows: carnumber_schoolname_specs.xls using the FSAE assigned car number and the complete school name, e.g. 001_University of SAE_spec.xls

WARNING – Failure to exactly follow the above submission requirements may result in exclusion from the Design Event. If your files are not submitted in the required format or are not properly named then they cannot be made available to the design judges and your team will be excluded from the event. You should check carefully the formatting and page count after creating your pdf.

S6.6 Excess Size Design Reports

If a team submits a Design Report that exceeds four (4) pages of text, three (3) pages of drawing and one (1) optional page, then only the first four pages of text, three pages of drawings and first optional page will be read and evaluated by the judges. Note: If included, cover sheets and tables of contents will count as text pages. Tip, cover pages add little value!

S6.7 Submission Deadlines

S6.7.1 The Design Report and the Design Spec Sheets collectively constitute the "Design Documents". The Design Documents must be submitted in compliance with the specific procedure and by the deadline shown on the FS website.

S6.7.2 The Design Documents must be submitted as separate files.

S6.7.3 Document submission will be acknowledged either on the FS website or by email. Teams should have a printed copy of this acknowledgement available at the competition as proof of submission in the event of discrepancy. Teams should be aware of the possible difference in International time zones.

S6.8 Penalty for Late Submission or Non-submission

The Design Report and the Design Spec Sheet collectively constitute the "Design Documents". Late submission or failure to submit all, or any one, of the Design Documents will be penalised at the standard negative ten (-10) points per day to a maximum of negative one hundred (-100) points. The website will not permit Design Documents to be uploaded any later than 10 days late. Non submission means your team will not participate in the Design Event and will receive zero (0) points for design. For the avoidance of doubt the most recent version of any document submitted will be the submission evaluated for both lateness and quality. You have been warned. See also A8.4

S6.9 Penalty for Unsatisfactory Submissions

At the discretion of the judges, teams that submit a Design Report or a Design Spec Sheet which, in the opinion of the judges does not represent a serious effort to comply with the requirements of Rules S6.2, S6.3 and S6.4 will also not compete in the design event, but may at the design judges' discretion receive between five (5) and twenty (20) points for their efforts.

S6.10 Design Event – Vehicle Condition

S6.10.1 Cars must be presented for design judging in finished condition, i.e. fully assembled, complete and ready-to-run.

S6.10.2 The judges may not evaluate any car that is presented at the design event in what they consider to be an unfinished state.

S6.10.3 Unfinished cars that are refused judging will receive zero (0) points for design.

S6.10.4 Point penalties may be assessed for cars with obvious preparation issues, e.g. notably loose or missing fasteners.

Note: Cars can be presented for design judging without having passed technical inspection, and even if final tuning and setup is in progress.

S6.11 Judging Criteria

S6.11.1 The design judges will evaluate the engineering effort based upon the team's Design Report, Design Spec Sheet and Business Logic Case, responses to questions and an inspection of the car.

S6.11.2 The design judges will inspect the car to determine if the design concepts are adequate and appropriate for the application (relative to the objectives set forth in the rules).

S6.11.3 It is the responsibility of the judges to deduct points if the team cannot adequately explain the engineering and construction of the car.

S6.11.4 Design Judging Score Sheet – The Design Judging Score Sheet will be available at http://www.formulastudent.com/formula-student/Teams/forms. The judges strongly urge all teams to read and study the score sheet and all other documents related to design judging that are available on the various official websites.

S6.12 Judging Sequence

S6.12.1 The actual format of the Design event may change from competition to competition and year to year as determined by the organizing body.

S6.12.2 The FS organisers reserve the right to organize Design Judging into one or more steps at their sole discretion.

S6.12.3 Design Judging is typically organized as follows:

1. Initial judging of all vehicles
2. Final judging ranking the top 4 to 8 vehicles (Design Final).

Note: only vehicles which start at least one Dynamic Event are eligible for the second or later steps, e.g. Design Final

S6.13 Scoring

S6.13.1 Scoring may range from 0 to 150 points at the judge's discretion.

S6.13.2 The judges may at their discretion award the highest placing team less than 150 points.

S6.13.3 The minimum Design score for any team completing Design shall be 10 points after penalties are applied provided all required documents have been submitted and the team participates in Design judging during their scheduled appointment with a completed car.

S6.14 Support Material

Teams may bring with them to the Design Event any photographs, drawings, plans, charts, example components or other materials that they believe are needed to support the presentation of the vehicle and the discussion of the their development process.

S6.15 Second Year Cars – Prohibited at Formula Student

APPENDIX S–1 COST MODEL AND COST METHODOLOGY – AS PER FSAE 2015 RULES

APPENDIX S–2 STANDARD PART NUMBERING – AS PER FSAE 2015 RULES

APPENDIX S–3 ORGANIZED LIST OF SYSTEMS & ASSEMBLIES

Appendix S-3 is posted at www.fsaeonline.com.

APPENDIX S–4 POWER TOOL PACKAGE ENVELOPES

Appendix S-4 is posted at www.fsaeonline.com.

APPENDIX S–5 2015 FORMULA STUDENT COST, MANUFACTURING & SUSTAINABILITY EVENT ADDENDUM

School:_____ Car Number:_____

(Please indicate decreases using bracketed numbers.)

	Section	Original Reported Total	New Reported Total	Difference	Cost Judge Initials
1					
2					
3					
4					
5					
6					
7					
8					

TOTAL VEHICLE	$	$	$

Summary of differences listed above. Attach fully detailed Costed Bill of Material for changes.

1
2
3
4
5
6
7
8

Accepted by:_____ Entered by:_____

Date: _____ Date/Time:_____

Addendums will be accepted only at the time of registration on-site at the competition!

These forms will then be forwarded to the cost judges the morning of the cost, manufacturing & sustainability event.

APPENDIX S–6 BUSINESS PRESENTATION JUDGING

An outline of the Business Presentation Scoring and associated guidelines will be posted on the FS website.

APPENDIX S–7 DESIGN JUDGING

The Design Event Score Sheet will be available on the FS website

Teams are advised to thoroughly read all the documents related to the Design Event that are posted on the FS website

2015 Formula SAE Rules
PART D - DYNAMIC EVENT REGULATIONS

ARTICLE 1: DYNAMIC EVENTS AND MAXIMUM SCORES

The maximum scores in the dynamic events are:

Acceleration	75 points
Skid Pad	50 points
Autocross	150 points
Efficiency	100 points
Endurance	300 points
Total	675 points

ARTICLE 2: WEATHER CONDITIONS – AS PER 2015 FSAE RULES

ARTICLE 3: RUNNING IN RAIN – AS PER 2015 FSAE RULES

ARTICLE 4: DRIVER LIMITATIONS – AS PER 2015 FSAE RULES

ARTICLE 5: ACCELERATION EVENT – AS PER 2015 FSAE RULES

ARTICLE 6: SKID-PAD EVENT – AS PER 2015 FSAE RULES

ARTICLE 7: AUTOCROSS / SPRINT EVENT – AS PER 2015 FSAE RULES

ARTICLE 8: ENDURANCE AND EFFICIENCY – AS PER 2015 FSAE RULES

D8.23 Economy Scoring Formula

Note: the mass of CO_2 released for other alternative fuels will be provided by Formula Student on request.

ARTICLE 9: FLAGS – AS PER 2015 FSAE RULES

ARTICLE 10: RULES OF CONDUCT

D10.8 Additional Conduct Rules

Specific rules and regulations applicable to the Formula Student event will be issued to all competitors prior to the event, which must be read fully by all team members.

D10.9 Advertising Regulations

To ensure full compliance with UK and European legislation, teams are not permitted to display any form of tobacco or cigarette advertising on their vehicles or display areas. The organisers also reserve the right to instruct teams to remove or cover any other vehicle or display area markings that may be illegal or likely to cause offence.

D10.10 Future Exclusion From Formula Student

In addition, the organisers hereby reserve the right to deduct points, or exclude individuals or teams from future competitions, if they act in such a way, at any time, as to actually or potentially bring the Formula Student name into disrepute. Teams or individuals associated with them, displaying and/or running their vehicles at any events organised by themselves or others, who use the Formula Student name while doing so, and act irresponsibly or recklessly, may, at the organiser's sole discretion, be deemed to have acted in breach of this rule.

D10.11 Considerations When Testing Your Vehicle

Teams are reminded that cars built according to the Formula SAE and Formula Student rules are not designed or intended for racing or use at high speed, or in confined areas where they might impact with solid objects, including safety barriers. Teams are advised to develop and run their vehicles on large, substantially open areas, and to do so only under similar speed and cornering conditions as they would face at official FSAE or FS events. It is further advised that all cars are checked by an official scrutineer - a list of all approved MSA scrutineers in the UK, who can be contacted, is available from the Operations Co-ordinator (Neil Carr-Jones, 01483 524400).

Testing Guidelines can be found on the Formula Student Website at: http://www.formulastudent.com/formula-student/Teams

ARTICLE 11: GENERAL RULES – AS PER 2015 FSAE RULES

ARTICLE 12: PIT RULES – AS PER 2015 FSAE RULES

ARTICLE 13: DRIVING RULES – AS PER 2015 FSAE RULES

ARTICLE 14: DEFINITIONS – AS PER 2015 FSAE RULES