

**FORMULA STUDENT**  
ALPE ADRIA

**COMPETITION  
HANDBOOK**

2024





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# CHANGELOG

| Release Date | Notes   | Version |
|--------------|---|---------|
| 22.02.2024   | Official Handbook 2024 Release  | 1.0     |
| 16.08.2024   | Updated refund policy<br>Updated protest application<br>Updated Event layout<br>Minor fixes | 1.1     |

# ABBREVIATIONS

|             |                                  |             |   |
|-------------|----------------------------------|-------------|---|
| <b>BOM</b>  | Bill of Material                 | <b>DSS</b>  | Design Spec Sheet                       |
| <b>BOTS</b> | Brake Over-Travel Switch         | <b>EDE</b>  | Engineering Design Event                |
| <b>BPDD</b> | Business Plan Deep Dive          | <b>EDR</b>  | Engineering Design Report               |
| <b>BPES</b> | Business Plan Executive Summary  | <b>ESF</b>  | Electrical System Form                  |
| <b>BPP</b>  | Business Plan Presentation       | <b>ESO</b>  | Electrical System Officer               |
| <b>BPPV</b> | Business Plan Pitch Video        | <b>ESOQ</b> | Electrical System Officer Qualification |
| <b>BSPD</b> | Brake System Plausibility Device | <b>EV</b>   | Electric Vehicle                        |
| <b>CBOM</b> | Costed Bill of Material          | <b>HSD</b>  | Hybrid System Description               |
| <b>CCD</b>  | Concept Class Driverless         | <b>HV</b>   | High Voltage                            |
| <b>CM</b>   | Cost and Manufacturing           | <b>IAD</b>  | Impact Attenuator Data                  |
| <b>CRD</b>  | Cost Report Documents            | <b>R2D</b>  | Ready-to-Drive                          |
| <b>CV</b>   | Combustion Vehicle               | <b>R2R</b>  | Ready-to-Race                           |
| <b>DBOM</b> | Detailed Bill of Material        | <b>SE3D</b> | Structural Equivalency 3D Model         |
| <b>DDT</b>  | Deep Dive Topic                  | <b>SES</b>  | Structural Equivalency Spreadsheet      |
| <b>DNF</b>  | Did Not Finish                   | <b>TMRF</b> | Team Member Registration Form           |
| <b>DR</b>   | Drivers' Registration            | <b>VSV</b>  | Vehicle Status Video                    |



# I. GENERAL INFORMATION

## I.1 EVENT INFORMATION

Formula Student Alpe Adria (FSAA) is an official Formula Student competition held in Croatia.

FSAA 2024 will have three classes: CV, EV, and CCD. Hybrid vehicles are a part of the CV category.

This year's competition will be held from the 20th of August until the 25th of August 2024 on the Rimac testing track in Mičevac, Croatia. Further information, ie., a detailed schedule of the event site, registration procedure, etc. will be published shortly before the event.

Every team must be registered on the official FSAA and FSG websites:

[FS Alpe Adria Website](#)

[FS Germany Website](#)

## PARTICIPATING TEAMS

For FSAA 2024 there are 20 CV (Hybrid Vehicles included) and 40 EV slots + 5 CCD teams.

## CONCEPT CLASS DRIVERLESS (CCD)

The teams participating in CCD will participate in static events (Business Plan Presentation, Cost & Manufacturing, Engineering Design) and in Cartdrive event.

The teams are not required to have a vehicle present. They can present a driverless (or non-driverless) vehicle to the judges, but this will not affect the final score.

Every team member participating in the CV or EV class of the competition cannot represent the team in the CCD class or vice-versa.

Cartdrive event is an addition to CCD in which teams will need to build a hand pushed cart, that will be driven around a small track with obstacles, blue and yellow cones, and curves. The teams will be judged based on blue and yellow cone recognition, obstacles avoidance/detection, mapping the track and other criteria. Purpose of the event is for the teams to familiarize themselves with the equipment and procedures of the driverless aspect of FS. A document detailing Cartdrive will be published in March 2024.



## REGISTRATION ON SITE

When the team arrives at the FSAA 2024 venue, officials will record your arrival and give you all the needed information about the next steps - registration, parking, unpacking the trucks, etc.

Only the Team Captain can register their team. They can be accompanied by only one team member. During the first step of the registration procedure, the Team Captain must submit a printed version of the “*Waiver of Liability*” signed by all team members, which will be provided to the Team Captains in advance. By signing the “*Waiver of Liability*”, the teams state that they accept the rules of the competition in addition to the FS Rules, that only team members will work on the vehicle, and that they understand and will follow the safety guidelines of the competition. After the registration, the Team Captain will receive a starter package which includes event wristbands, the Competition Handbook, etc. ESOs need to show a valid ID at the registration office to receive a wristband after the team is set up in the pits. The drivers will receive a wristband after they complete the egress test.

## COMPETITION VESTS

A refundable deposit will be collected for dynamic and media vests [€50].

Each team will receive 4 dynamic vests that need to be worn inside of dynamic area at all times. The only exception to this rule is the driver if (s)he is sitting in the car.

Team members wearing media vests can only carry out media duties (photograph, film). Media vests allow team members to enter dynamic area (track area only) but are limited to marked media spots and must obey the orders of the officials (organizers, track marshals). A team member with a media vest in the dynamic area is not allowed to work on the car, push the car, carry equipment and conduct other related activities. Not conforming to these rules can be sanctioned by the officials.

## REFUND POLICY

In case a team wants to withdraw from the competition a 75% refund is available until 1.5.2024, after that date no refund will be possible.

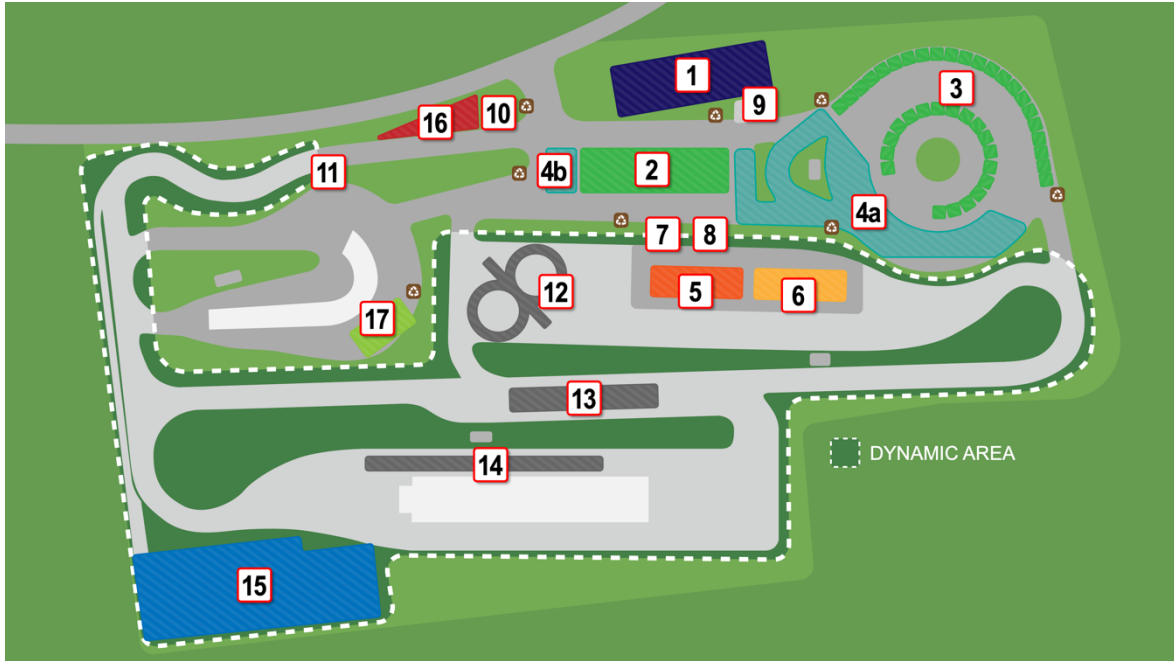
## I.2 DATA LOGGERS

The Data Loggers used at the competition will be provided after the team registration is complete. Data Loggers used will be the same as on FS East ([Data Logger Specification](#)).

A refundable deposit will be collected for the Data Loggers [€250].

## II. TRACK AND ACCOMMODATION

Track: Bugatti Rimac Test Track, Mičevac, Velika Gorica ([Location](#))



|   |   |    |                  |
|---|---|----|------------------|
| 1 | Event Central<br>Info Point, Registration, Static Disciplines | 9  | Rain Test        |
|   |   | 10 | Welding Area     |
| 2 | Pits A  | 11 | Noise Test       |
| 3 | Pits B  | 12 | Skidpad          |
| 4 | Commercial Area   | 13 | Brake Test       |
| 5 | Scrutineering Area  | 14 | Acceleration     |
| 6 | Charging Area   | 15 | Practice Area    |
| 7 | Refueling Station   | 16 | Emergency Center |
| 8 | Tilt Test   | 17 | Standings        |

**THE RACING TRACK CAN BE A DANGEROUS PLACE, safety is our #1 concern!**

Every participant has to be aware of that and accept and abide by the provided rules and recommendations. Rule breaking at the event can lead to; penalty points, disqualification, or similar punishment may be exerted by the FSAA officials.



## III. EMERGENCY INFORMATION

### III.1 SAFETY

#### MINOR INJURY

MEDICAL CENTRE – in the event of a minor injury (shallow cut, small bruising...) please accompany the injured person to the Medical Centre. Emergency aid is provided there. The Medical Centre is available every day during the event.

#### SEVERE INJURY

TAKE ACTION, RESPOND – if someone is severely injured and requires urgent help, do not hesitate, and immediately call the emergency services. The emergency number for every landline and mobile phone is 112 (also see information about emergency calls below). You can communicate with them in English. If you have proper first aid training, help to the best of your ability. Let the organizers know about the emergency as soon as possible.

#### BEHAVIOUR IN CASE OF REGULAR FIRES

(FUEL, OIL, PAPER, WOOD, ETC.)

Call for help (firefighters/ambulance) by either finding an official with a radio or calling 112. Assist injured people to leave the area and provide first aid if you can. Try to extinguish the fire if it is possible without risking your safety. If an electric consumer is on fire, first cut the power to it. If the fire cannot be put out, leave the area, and instruct others to do so as well. Wait for the firefighters/ambulance to arrive.

#### BEHAVIOUR IN CASE OF ACCUMULATOR FIRES

Immediately leave the area within a radius of 5 meters and instruct others to do so as well. Assist injured people to leave the area. An overheated accumulator is extremely dangerous so do not put yourself in danger by trying to put it out. Fire extinguishers may be used from a distance to reduce the spread of the fire. Provide first aid to the injured if you can. See the below section on what to do in case of electric shock - in any case, do not give the victim(s) water or food. Call for help by finding an official with a radio or by calling 112 yourself. Wait for the firefighters and ambulance to arrive, who will handle the situation. Stay out of the way of fumes coming from the accumulator or the vehicle; mind the wind direction.



## BEHAVIOUR IN CASE OF ELECTRIC SHOCK

Call for medical help by finding an official with a radio or by calling 112 yourself, preferably in parallel to the steps below. Push one of the emergency shutdown buttons and wait until the TSAL is switched off. Note that this can take up to 5 seconds, wait patiently. Try to talk with the victim and ask him/her about his/her health. Insulate yourself if you must move a victim away from a live contact – wear dry gloves (a requirement for every EV push-bar) or cover your hands with multiple layers of cloth and cover potential contact paths with the vehicle with the HV isolation blanket. Watch your footing to make sure that you do not slip or fall when trying to move the victim. Do not move the victim if there is a possibility of neck or spinal injuries unless (s)he is in immediate danger. Do not give water or food to the victim. If the victim is not breathing move the victim to solid ground and start with CPR procedures immediately. Ask a bystander to find an official, who will provide an Automated External Defibrillator. Cover burns with a sterile dressing. Electrical burns may not look serious on the surface, but the burn can be severe deeper in the tissue. Keep the victim comfortable, warm, and at rest, and monitor his/her breathing until the ambulance arrives. The victim might undergo ventricular fibrillation several minutes after experiencing a shock.

### III.2 EMERGENCY SERVICES

In case of an emergency, please call one of the numbers listed below. Those numbers are available 24/7.

|                                 |     |
|---------------------------------|-----|
| General emergency number:       | 112 |
| Ambulance emergency number:     | 194 |
| Firefighters' emergency number: | 193 |
| Police emergency number:        | 192 |

Hospital:

[University Hospital Centre Zagreb](#)

Ulica Mije Kišpatića 12, 10000, Zagreb, Croatia





## IV. RULES AND GUIDELINES

Everyone (participants, volunteers, and spectators) at FS Alpe Adria 2024 would like to enjoy an accident-free event! These guidelines have been established to advise teams of potentially unsafe practices in the pits and dynamic area.

### IV.1 OFFICIAL RULES

The official rules of the competition are Formula Student Rules 2024 (v1.1) also referred to as FS Rules 2024. They can be found on the FS Germany [website](#). In case of dispute between this handbook and FS Rules 2024, rules in this handbook supersede any other rules and regulations. The officials reserve the right to a final decision.

### SCORING

The scoring system is based on the Formula Student Rulebook 2020, with exceptions that are explained in this Handbook.

|                            | CV & EV     | CCD         |
|----------------------------|-------------|-------------|
| Static Events:             |             |             |
| Business Plan Presentation | 75 points   | 150 points  |
| Cost and Manufacturing     | 100 points  | 200 points  |
| Engineering Design         | 150 points  | 300 points  |
| Dynamic Events:            |             |             |
| Skid Pad                   | 75 points   |             |
| Acceleration               | 75 points   |             |
| Autocross                  | 100 points  |             |
| Endurance                  | 325 points  |             |
| Efficiency                 | 100 points  |             |
| Cartdrive                  |             | 350 points  |
| Overall                    | 1000 points | 1000 points |

### OFFICIAL PROTEST

If any disputes shall arise, the team(s) can submit a written complaint at any time via the email: [hello@fs-alpeadria.com](mailto:hello@fs-alpeadria.com). Complaints must be submitted within 6 hours of the alleged dispute. The complaint will be processed within 24 hours of submission. Complaints that will not include the necessary information (car#, team name, university name, car classification, team captain info, clearly outlined complaint, to which rules, and regulations it applies etc.) will be dismissed. If the formal protest is rejected, the team surrenders 15 points from the overall score.



## IV.2 EVENT RULES

### BEHAVIOUR

Alcohol, illegal drugs, weapons, or other illegal materials are prohibited on the event site during the event. Use of motorcycles, quads, bicycles, skateboards, scooters or rollerblades in the pit area is prohibited as are self-propelled pit carts, tool boxes, tire carriers, and any similar device.

### ALCOHOL

PLEASE NOTE: Alcohol is strictly forbidden on the event site. There will be alcohol testing (breathalyzers) during the event.

### TRASH

It is the team's responsibility to keep their pits clean throughout the event. There are trash bins in the pit and near the campsite. No trash (including broken parts, old furniture, worn-out tires, or other materials) may be left behind at the end of the event.

### FIRES AND SMOKING

No open fires are allowed at the event site (except for the campsite - cooking area and unless marked otherwise). This includes BBQ grilles, oxy-acetylene torches, heaters, cigarettes, etc. Smoking is strictly prohibited in the dynamic area, all buildings, and the pit area. Smoking is permitted only in the dedicated area marked with signs.

### WORKING ON THE VEHICLE

Use of any electrically powered tools that results in sparks (angle grinders, welding...) is only allowed in the welding area. While using any powered tools, safety glasses are required and ear protection is recommended. All members participating in the dynamic area and scrutineering and working on the vehicle must wear closed shoes and adequate long trousers (excluding stretch and nylon pants). For welding, only use the power outlet that is marked for welding, and do not use more than one welding machine at a time.

### RUNNING ENGINES

You can run engines (IC) only in the designated engine test area after passing scrutineering. Putting the vehicle in ready-to-drive mode (EV) can be done in engine test area after scrutineering or in the pits if the vehicle is lifted off the ground, all driven wheels are off and a scrutineer is present to oversee the procedure.



## ACCUMULATORS

Whenever the TS Accumulator is installed in the car, the car shall be on the ground with wheels mounted and shall be easily moveable to remove it from the pits. The exit of the pit must be left free at all times.

Whenever the accumulator is inside the team's pit on the hand cart it has to be stored by the unobstructed pit exit at all times, with the handle facing outside.

A mandatory resting area will be available at the event where the TS Accumulator must be stored for at least 60 minutes after charging, before being installed in the car.

## FIRE EXTINGUISHERS

Your fire extinguishers must always be immediately accessible. All team members must be familiar with their use. We recommend that teams have additional (dry chemical/dry powder) fire extinguishers in their pits.

## READY-TO-RACE (R2R)

The ready-to-race condition demands that a vehicle must be fully assembled, with all the bodywork and fluids filled up to the maximum fill level, in complete and finished condition.

## READY-TO-DRIVE (R2D)

The ready-to-drive condition demands that a vehicle must be in R2R condition and with a driver inside of the vehicle using the required driver's equipment.

## DRIVING PRACTICE

Driving practice is only allowed during the designated times in the Practice Area.

## SPECIAL NOTE FOR DRIVERS

All drivers should check the critical fasteners and components on their vehicles to ensure complete control during driving events. Fasteners do come loose; parts do break due to fatigue and occasionally someone forgets to torque a nut – you will be intimately held responsible if this happens. While on the track, drivers must wear helmets and required equipment at all times, until the track marshals declare it safe.

**REMEMBER: USE THE KILL SWITCH in case of an engine or brake malfunction!**



| No. | Document  | Category | Deadline   | Re-upload deadline (days) | Daily penalty points | Last submission deadline | Document format/upload to |
|-----|---|----------|------------|---------------------------|----------------------|--------------------------|---------------------------|
| 1   | IAD    Impact Attenuator Data                   | All      | 2024/03/15 | 7                         | 15                   | 2024/03/22*              | FSG website**             |
| 2   | SES    Structural Equivalency Spreadsheet       | All      | 2024/03/15 | 7                         | 15                   | 2024/03/22*              | FSG website**             |
| 3   | SE3D    Structural Equivalency 3D Model         | All      | 2024/03/15 | 7                         | 15                   | 2024/03/22*              | FSG website**             |
| 4   | ESF    Electrical System Form                   | EV       | 2024/03/29 | 7                         | 15                   | 2024/04/05*              | FSG website               |
| 5   | HSD    Hybrid System Description                | HV       | 2024/04/19 | -                         | 10                   | 2024/04/26               | zip/FSAA website          |
| 6   | BPES    Business Plan Executive Summary         | All      | 2024/06/14 | -                         | 5                    | /                        | pdf/FSAA website          |
| 7   | BPPV    Business Plan Pitch Video               | All      | 2024/06/14 | -                         | 5                    | /                        | Include in BPES           |
| 8   | DSS    Design Spec Sheet                        | All      | 2024/06/14 | -                         | 5                    | /                        | xlsx/FSAA website**       |
| 9   | EDR    Engineering Design Report                | All      | 2024/06/14 | -                         | 5                    | /                        | pdf/FSAA website          |
| 10  | BPDD    Business Plan Deep Dive                 | All      | 2024/06/22 | -                         | 5                    | /                        | pdf/FSAA website          |
| 11  | CRD    Cost Report Documents                    | All      | 2024/07/19 | -                         | 10                   | /                        | zip/FSAA website          |
| 12  | VSV    Vehicle Status Video                     | All      | 2024/08/02 | 2                         | 10                   | 2024/08/09*              | link/FSAA website         |
| 13  | ESOQ    Electrical System Officer Qualification | EV       | 2024/08/02 | -                         | 10                   | 2024/08/09*              | pdf/FSAA website          |
| 14  | DR    Drivers' Registration                     | All      | 2024/08/02 | -                         | 10                   | /                        | xlsx/FSAA website**       |
| 15  | TMRF    Team Member Registration Form           | All      | 2024/08/09 | -                         | 10                   | /                        | xlsx/FSAA website**       |

\*If the team fails to upload the document by the last submission date, they will be de-registered.

\*\* Template available



### IV.3 DOCUMENT UPLOAD

The maximum file size for each document that is uploaded to the FSAA website must not exceed 50 MB. The team is responsible for successful document upload. If the upload fails, please contact us [here](#). Keep in mind, that document upload could be slower right before the deadline.

#### DOCUMENT NAMING

All the documents have to be named in the following format:

*Car#\_documentabbreviation\_documentversion*

Example:

*E69\_EDR\_v2*

\*Document version is necessary only in the case of a re-upload (v2, v3...)

\*\*Car# should be 3 characters long, ### for CV and E## for EV

Not respecting the document naming convention can lead to up to 10 penalty points per document or the document not being accepted. The penalty points will be deducted from the overall score, while the not accepted documents will receive 0 points and penalty points for late submission.

#### SUBMISSION DEADLINE

All documents and links have to be uploaded by 13:00 CE(S)T on the deadline day. Documents that have to be uploaded to the FSG website do not have to be uploaded to the FSAA website.

If a team fails to upload IAD, SES, SE3D, ESF, and VSV documents by the last submission deadline they will be de-registered from the competition. Re-upload days are only meant for corrections, when required from the organizers. The team will be notified via email. The countdown starts with the sending of the email. Daily penalty points are also applied for late re-upload submission. For all the documents that are part of the static disciplines, the team will receive penalty points up to the maximum possible points available for the discipline they are for.

Penalty points will be deducted from the overall score.

# V. TECHNICAL AND SAFETY INSPECTION

## V.1 GENERAL

The vehicle must pass the Technical and Safety Inspection (also referred to as Scrutineering) before being allowed to the Engine Running Area, Practice Area, or take part in the dynamic disciplines. All vehicles (CV & EV) must pass the following inspections:

| CV   | EV                                    |
|--|---------------------------------------|
| Pre-Inspection & Driver Egress   |                                       |
| Mechanical Scrutineering;<br>including Hybrid inspection (if applicable) | Accumulator Scrutineering             |
|  | Mechanical Scrutineering              |
|  | Electrical Scrutineering<br>(LV & HV) |
| Vehicle Weighing   |                                       |
| Tilt Test  |                                       |
| Noise Test   | Rain Test                             |
| Brake Test   |                                       |

The event technical inspection stickers will be placed on the nose of the vehicle. If a vehicle is no longer in compliance with the rules, the officials will set the vehicle's technical inspection status to fail, remove the respective inspection sticker(s) from the vehicle and note the reason for revoking the technical inspection approval in the technical inspection sheet.

Time slots and queue for scrutineering will be determined by the chronological submission of the Vehicle Status Video (VSV). The final time slot table will be uploaded to the competition website 7 days before the competition. If the team is not done with scrutineering in the given time slot, they must leave the scrutineering area and re-enter the queue later. If the team is more than 15 minutes late for their slot, it will be forfeited and given to the next team in queue.

Charging connectors available in the Charging Area: 400 V, 50 Hz, 3-phase CEE charging connectors (3L+N+PE 6h) with 16 A and 32A as well as 230V, 50Hz, 1-phase CEE 7/3 "Schuko".



## V.2 SCRUTINEERING

### PRE-INSPECTION

Must be done before mechanical inspection. Will be done in pits together with driver egress.

### MECHANICAL SCRUTINEERING

**NOTE:** Four team members (incl. the tallest registered driver) are allowed to enter the technical inspection.

The TS accumulator must be outside of the car. [EV only]

Can be done in parallel with accumulator inspection. [EV only]

The officials reserve the right to check any vehicle at any time during the event.

### ELECTRICAL INSPECTION [EV ONLY]

The electrical scrutineering is divided into two parts – Low Voltage & High Voltage part.

LV electrical inspection can be done in parallel to the accumulator or before the accumulator inspection is passed but the accumulator shall be outside of the vehicle in that case.

### ACCUMULATOR SCRUTINEERING

Must be done before HV electrical inspection.

### NOISE TEST

The functionality of the BSPD system will also be checked in the noise test area. After passing, the airtightness of the intake system will be tested by closing off the inlet after which the engine must stall.

### BRAKE TEST

The BOTS will be checked according to FS Rules 2024 (T 6.2).

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

Half rotation difference between the front and rear axle allowed.



## VI. STATIC EVENTS

### VI.1 BUSINESS PLAN PRESENTATION EVENT

The BP has to be within the scope of Formula Student but does not necessarily need to be about the team's specific vehicle. It can be a service or a product that stems from or uses aspects of FS car.

A team may be deducted points if they fail to finish the presentation in their assigned time of 10 minutes (replaces FS Rules S 1.2.5). Each team will have 5 minutes for preparation beforehand and the presentation will be followed by 5 minute Q&A.

The BPP Finals will feature 6 teams (CV or EV), which will be held the next day.

The scoring formula for the non-finalist is calculated according to FS Rules 2024 (Rule S1.4 "Business Plan Presentation Scoring"). The final score will be calculated from the intermediate score through normalization and scaling.

#### BPP DOCUMENTS

Business Plan Executive Summary (BPES) - One DIN A4 page long electronic document, single-sided, containing a summary of a Business Plan. The header/footer must include the Team name, Car #, University name, and a hyperlink to BPPV. The document can contain graphics and pictures. The intent of an BPES is to prepare the potential investors for the team's presentation and to familiarize them with the business idea. BPES should therefore contain all of the relevant information and should present the investors with all the crucial information regarding the Business Plan.

Business Plan Pitch Video (BPPV) - A short 60 s video in accordance with the FS Rules 2024 (S 1.3) included in the BPES and uploaded by the deadline to the competition website. A link to the video must be in the header or footer of the BPES and must be viewable without any additional installation of software necessary for the judges (Youtube video link recommended).

Deep Dive Topic (DDT) report - The Deep Dive Topic (with instructions) will be announced on the FSAA website. Teams will have 7 days to research and submit a report about the topic. The document will have a minimum of 4 and a maximum of 7 pages (DIN A4 format, font size 12). The DDT doesn't need to be part of the BPP. It can be included in the BPP, at the teams' discretion. The final document will be uploaded to the competition website.

There will be point deductions for not following instructions and rules in this Handbook. FS Rules (S 1.1.1, S 1.1.3, S 1.2.5, S 1.2.6, S 1.3.3, S 1.4.1, S 1.4.2) are to be disregarded and the rules stated in this Handbook are to be followed instead.





## VI.2 COST AND MANUFACTURING EVENT

Before the event, three Cost Report Documents (CRD) must be uploaded to the FSAA website by the given deadline (in one zip file). A discussion topic for the »Cost Understanding« will be announced during the first Team Captain Briefing at the event. During the event, a 45-minute-long discussion with the judges will take place, next to the team's vehicle. The discussion is split into three parts:

### BILL OF MATERIAL (BOM) DISCUSSION (PART 1)

A discussion to evaluate the team's ability to prepare an accurate engineering and manufacturing BOM for the complete vehicle. The discussion consists of two parts, which will be discussed simultaneously by two judges:

- Bill of Material (BOM) and Detailed Bill of Material (DBOM)
- Costed Bill of Material (CBOM) and Cost explanation file

### REAL CASE (PART 2)

At the first Team Captain Briefing, teams will be presented with a topic in the form of a problem. Teams shall prepare an 8-minute presentation using no more than five pages or presentation slides. The presentation will take place during the Cost and Manufacturing event.

### COST UNDERSTANDING (PART 3)

A discussion to evaluate the general cost of manufacturing knowledge of the team. Discussion topics will be based mostly on the Real case presented by the team.

### COST REPORT DOCUMENTS (CRD)

The CRD consists of the following documents (upload as one zip file to FSAA website):

- The BOM including DBOM and CBOM created online on the FSG website and uploaded as a pdf to the event website
- The supporting material file uploaded as a pdf file to the event website
- The cost explanation file uploaded as a pdf file to the event website

Bill of Material (BOM): The BOM is a sorted list for every vehicle part. The BOM must list all parts and equipment fitted to the prototype vehicle at any time during the event. The BOM is structured according to FS Rules (S 2.4).



Detailed Bill of Material (DBOM): The manufacturing processes of all parts from a specified must be listed in the DBOM. In addition to the BOM, the DBOM has to include everything listed in FS Rules (S 2.5). DBOM for the “Suspension” must be submitted for FS Alpe Adria 2024.

Costed Bill of Material (CBOM): The actual costs of the prototype vehicle as presented must be included for a specific system. The cost calculations must include the costs of materials, fabrication, bought parts, and assembly of the vehicle and must be completed as realistically as possible. The cost calculations have to be done according to FS Rules 2024 (S 2.6). CBOM for the “Engine and Drivetrain” must be submitted for the FS Alpe Adria 2024.

*\*Scoring for BPP and C&M for CCD is the same as for the CV & EV categories.*

### VI.3 ENGINEERING DESIGN EVENT

A Design Spec Sheet (DSS) and Engineering Design Report (EDR) must be submitted online on the competition website until the required deadlines.

#### SCORING (CV & EV):

| Category                               | Points |
|--|--------|
| Aerodynamics                           | 24     |
| Chassis and Ergonomics                 | 24     |
| Electrical and Control Systems         | 24     |
| Overall Vehicle Concept and Management | 24     |
| Powertrain                             | 24     |
| Vehicle Dynamics                       | 24     |
| EDR                                    | 6      |

#### SCORING (CCD):

| Category                               | Points |
|--|--------|
| Aerodynamics                           | 15     |
| Chassis and Ergonomics                 | 15     |
| Electrical and Control Systems         | 15     |
| Overall Vehicle Concept and Management | 15     |
| Powertrain                             | 15     |
| Vehicle Dynamics                       | 15     |
| Autonomous Functionality               | 50     |
| EDR                                    | 10     |



The final design score will be calculated from the intermediate score through normalization and scaling.

The evaluation process will take 40 minutes with 5 minutes for judges to sum up all comments and 15 minutes break between each team. For the finals, there will be 30 minutes for evaluation and 10 minutes break between each finalist. If present in the vehicle, an evaluation of the hybrid powertrain system will also be part of the EDE.

3 CV and 3 EV teams with the highest scores will advance to the ED Finals, where they will be evaluated again.

Engineering Design Event (EDE) objective, vehicle condition, and judging criteria will be evaluated according to FS Rules 2024 section S 3 (with the exception of rule S 3.7.2).

Sections from FS Rules 2024, S3.1.3 and S3.2.1, will be applied only in Concept Class Driverless (CCD) EDE.



## VII. DYNAMIC EVENTS

### VII.1 TEAM CAPTAINS AND DRIVERS' BRIEFINGS

The Team Captains briefing will be held on Day 1 and 2. Drivers' briefings will be held on each day the track is open. All drivers for that day and Team Captains must attend. The briefings contain general event information and detailed information about the dynamic events of the day.

In total, a minimum of four and a maximum of six drivers are allowed for each team. The drivers must be registered and show a valid driving license. Before the event, teams need to send copies of the driving license for all registered drivers.

### VII.2 DYNAMIC DISCIPLINES

#### ACCELERATION

Timing will start when any part of the vehicle crosses the start line. Once the vehicle passes the start line, the run has been officially attempted and cannot be re-started. Each team has four runs, driven by two drivers with two runs each. Each driver has the option to make a second run immediately after their first run.

#### SKID PAD

The fastest of the runs completed, including penalties, will be used to calculate the team's score. Each team has four runs, driven by two drivers with two runs each. Each driver has the option to make a second run immediately after their first run.

#### AUTOCROSS

Each team has four runs, driven by two drivers with two runs each. Each driver has the option to make a second run immediately after their first run.

#### ENDURANCE

Starting order is based on autocross qualification (reverse order). The event officials reserve the right to adjust the running order as necessary during the event to maintain safe operations and the flow of the event.

Only two team members, alongside the two drivers, are allowed in the staging area for the vehicle.

NOTE: Based on past experience from Formula Student events, a sudden need for new teams in the waiting queue due to DNFs is anticipated. To ensure fair and equal conditions for all teams, there will always be at least 3 cars on the track. It is the team's



responsibility to make sure they are not late for their turn and to be at least 3<sup>rd</sup> car in the queue. If the team is not ready when the track marshal calls them to start their run, they will be given a 2-minute penalty and a start at the end of the endurance event (if there is time left). Please be prepared to attend the queue on time!

[EV Only] At least one ESO must always be present in the dynamic area during dynamic events. If the current driver is the ESO, at least one of the other three team members must also be an ESO to successfully check the car during the driver change.

No repairs or work may be performed on the vehicle during the event (except for tire changes due to weather conditions and to accommodate the second driver).

Once the vehicle passes the start timing line, the run has been officially attempted and cannot be re-started. If the vehicle stalls before triggering the timing lights, it can be pushed back for a re-start. This is only allowed once per run. If the vehicle demonstrates difficulty in launching, it will need to be pulled away and repaired.

The Post Event Technical Inspection must be passed to score points in the endurance event.

## EFFICIENCY

Efficiency points will be awarded as stated in FS Rules 2020 (v1.0) D7.9, using the formulas below:

[CV only]

$$EFFICIENCY\_SCORE = 100 \left( \frac{\frac{E_{min} - 1}{E_{team}}}{\frac{E_{min} - 1}{E_{max}}} \right)$$

$E_{team}$  - team's efficiency factor

$E_{min}$  - the lowest efficiency factor of all teams that are considered for efficiency

$E_{max}$  - the highest efficiency factor of all teams that are considered for efficiency

The efficiency factor is calculated based on the following formula:

$$EFFICIENCY\_FACTOR = \frac{T_{min} \cdot V_{min}}{T_{team} \cdot V_{team}}$$

$T_{min}$  - fastest uncorrected elapsed driving time of all teams that are considered for efficiency

$V_{min}$  - lowest corrected used fuel volume of all teams that are considered for efficiency

$T_{team}$  - team's uncorrected elapsed driving time

$V_{team}$  - team's corrected used fuel volume



The measured fuel volume of vehicles using E 85 fuel is divided by 1.4 to be comparable to vehicles using 98 RON.

[EV ONLY]

$$EFFICIENCY\_SCORE = 100 \left( \frac{\frac{0.1}{E_{team}} - 1}{\frac{0.1}{E_{max}} - 1} \right)$$

$E_{team}$  - team's efficiency factor

$E_{max}$  - highest efficiency factor of all teams that are considered for efficiency

The efficiency factor is calculated based on the following formula:

$$EFFICIENCY\_FACTOR = \frac{T_{min} \cdot EN_{min}^2}{T_{team} \cdot EN_{team}^2}$$

$T_{team}$  - team's uncorrected elapsed driving time

$T_{min}$  - fastest uncorrected elapsed driving time of all teams that are considered for efficiency

$EN_{team}$  - team's corrected used energy

$EN_{min}$  - lowest corrected used energy of all teams that are considered for efficiency

NO PERSONAL MOTORIZED OR SELF-PROPELLED VEHICLES (SCOOTERS, SKATEBOARDS ETC.) ARE ALLOWED ON THE COMPETITION SITE. DRONES OR OTHER AERIAL EQUIPMENT ARE STRICTLY FORBIDDEN (NO WARNINGS).

ANY VIOLATIONS OF THIS POLICY MAY LEAD TO DISQUALIFICATION.



## VIII. CONTACT INFO

| ORGANIZERS     | RESPONSIBILITY | CONTACT                         |
|----------------|----------------|---------------------------------|
| Luka Pavlović  | General        | luka.pavlovic@fs-alpeadria.com  |
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