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2023

UPDATE MAGAZINE

FSFEUP

END OF YEAR EDITION

FORMULA STUDENT FEUP

PORTO, PORTUGAL

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CONTENT

FINAL ASSEMBLY

WHAT SUBSYSTEMS HAVE BEEN ASSEMBLED SINCE LAST TIME?

In the lead-up to the competitions, we diligently worked on assembling the key subsystems, culminating in the **completion of the overall prototype.**

To accomplish this goal, some final manufacturing processes were performed with the **aid of our sponsors!**

Building a functional prototype is really a challenge, but having a manufacturing phase where the highest attention to detail is paid really pays dividends and allows for an **increased chance of success** when testing the prototype.

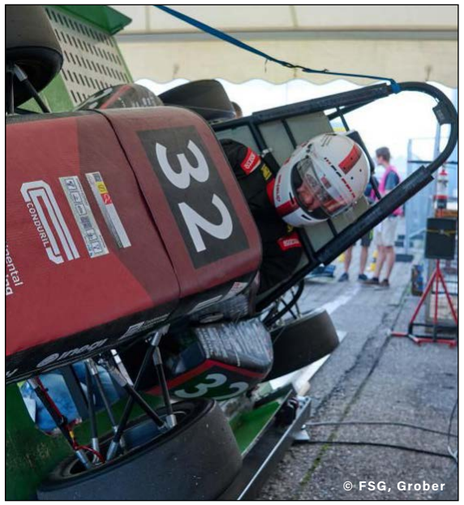
These **essential components** encompassed the suspension, the Tractive System Accumulator, the transmission, the motor and its controller's cooling circuit, the prototype's wiring harness, and various other subsystems.

TESTING

PREPARING THE TEAM AND PROTOTYPE FOR THE UPCOMING COMPETITIONS

Following the successful assembly of the prototype, the team's primary goals revolved around **preparing a thoroughly tested race car** for the upcoming competitions. This endeavor was pivotal in not only ensuring that the team could successfully navigate technical inspections but also in fine-tuning the performance of the developed vehicle.

The team conducted a series of brake tests, allowing for precise calibration of the braking system to achieve the **optimal braking performance**, including the ability to simultaneously lock all four wheels during hard braking. Additionally, **acceleration** in order to fine tune the motor controller's parameters was performed, as well as other **vehicle dynamics** parameters.

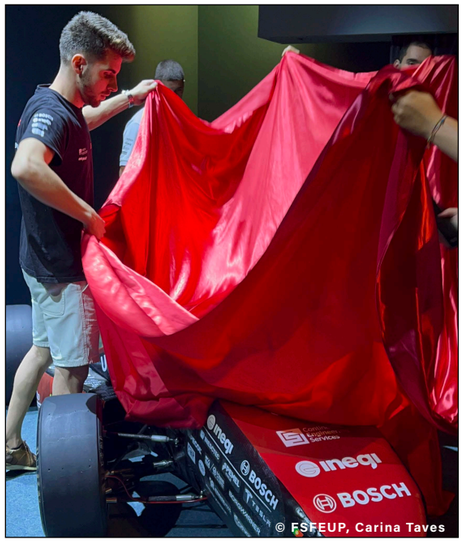


The meticulous testing phase yielded quite significant benefits during the competitions, particularly in the team's ability to **pass all brake tests** with the prototype, demonstrating its capabilities and readiness for the challenges of the competitions.

ROLLOUT ‘23

ON JULY 11TH 2023, WE INTRODUCED THE CULMINATION OF OUR HARDWORK TO THE WORLD

This event marked a **significant milestone** in the first team cycle. Finally, the team had the opportunity to showcase the culmination of all their hard work by unveiling the team’s inaugural **Electric Vehicle** (EV) prototype to sponsors, institutional partners, educators, technicians, friends and families.



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Every team member will forever cherish the memory of filling FEUP’s main “Auditório”, as it served as a heartwarming confirmation of the **unwavering support** the team has received from the entire community.

We extend our **heartfelt gratitude** to all our sponsors who were able to join us on this momentous day, as well as for their continuous support over the past two years. Your contribution has been **invaluable** to our success.

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COMPETITIONS

THIS SUMMER, THE TEAM TOOK PART IN THREE COMPETITIONS AROUND EUROPE

According to the plan for the design, manufacturing, and assembly of the first electric competition prototype by the Formula Student team from FEUP, we are proud to announce the objective of competing in **three high-level competitions** on the European competition calendar was achieved: FSUK (Silverstone, England), FSPT (Castelo Branco, Portugal), and FSG (Hockenheim, Germany), with a clear focus on the latter, which is the **highest-rated competition** in the world ranking.

© FSUK

The objectives were quite clear: to compete and **complete the dynamic events** inherent to a Formula Student competition, including Acceleration, Skid Pad,

© FSFEUP, Diana Afonso

Autocross, and the ultimate test of a car’s reliability, the **Endurance** (which consequently carries a scoring component associated with the car’s efficiency). Competing in these events already implies having a car capable of passing all the **exhaustive technical inspections**: mechanical, accumulator, electrical, tilt test, rain test and a brake test. It is with great pride that we can affirm that we successfully completed all technical inspections and competed in the Endurance events at FSUK, FSPT, and FSG, as well as completing all the other dynamic events at FSG. It is a **source of happiness** and pride to

share that the team was appreciated throughout the competitions for its high level of preparation in approaching technical inspections, having received verbal commendations and also winning the award for the team with the best preparation for technical inspections at FSG, among a field of **100 teams** – many with more than **20 years of history**.

© FSFEUP, Diana Afonso

One of the major strengths of our team is the static events component, including the evaluation of the car's costs, the development of a business plan and the extensive evaluation of the design of our prototype. These were also significant investments for the team, and we received positive feedback regarding both macro and micro decisions made regarding the team's project and prototype.

FSUK (SILVERSTONE CIRCUIT)

FSUK took place between July 19th and 23th in Silverstone Circuit and the team came back with some **exciting news**, being the first time our prototype raced an Endurance Event!

Being at such a prestigious race track, the team faced this first competition with a **huge level of commitment**. Here, the team was split in two parts: the Driverless DDT competition and the Class 1 Formula Student competition, where we presented our design and **raced our prototype**.

The main achievements were:

- Completed **technical inspections.**
- Competed in the **Endurance event.**
- Awarded **"Best EV Newcomer".**
- **First place in the Business Plan of FS-AI.**

© FSUK

FSPT (KARTÓDROMO DE CASTELO BRANCO)

For the first time, our country hosted a Formula Student Event in Kartódromo de Castelo Branco and of course **we couldn't miss it**! From July 31st to August 5th the team competed in Castelo Branco and we added some achievements to our record!

After the intense moments during the FSUK competition, the team was more **motivated** than ever to keep improving both the team's and the car's performance.

Wanting to keep gaining momentum for the **grand finale** that FSG would prove itself to be for the European tour, the team kept its high level of focus through the whole competition.

This first international Formula Student competition based in Portugal was a **success** both from the team and from the competition itself in terms of organization and event quality.

The team's overall results were:

- Completed **technical inspections.**
- Competed in the **Endurance event.**
- Reached the **finals** of the static events in **Engineering Design and Cost.**


© FSPT

FSPT


© FSPT

FSG (HOCKENHEIMRING)

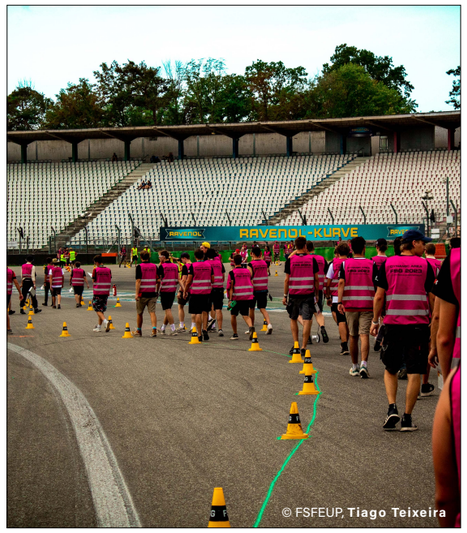
Formula Student Germany is the **highest rated Formula Student competition in the world**, and took place in Hockenheim from the 14th of August until the 20th .

The time had arrived, after two years of dreaming and hardwork the team was present at the pinnacle of Formula Student, the **highest-level engineering** design competition for University students. With a high sense of responsibility and motivation, the team started and ended the performance well during the competition, being the **first team to pass technical inspection** and then test in the practice area!

Being a **strict and demanding** competition, our team is extra proud of our path, this makes the end of the 2023 competitions all the more special.

In Germany, while competing against teams with decades of history our team managed to prove our worth, accomplishing:

- Completed **all of the technical inspections.**
- Competed in **all of the dynamic events.**
- Received the **“FSG Best Prepared Car for Technical Inspection” award.**



WHAT’S NEXT?

TEAM RESTRUCTURING AND THE PASSING OF THE TESTIMONY

Formula Student operates in **cycles** and FSFEUP is currently entering a transitional phase as a result. The upcoming cycle will be structured as a **two-year plan**, extending until autumn 2025.

FSFEUP’s ultimate aim is to become a long-lasting and continually improving team. Our primary objective is to achieve a **high level**, aspiring to be among the **top 10 teams** in the Formula Student Germany (FSG) competition by the end of the decade. Our decisions, both conceptual and those directly affecting the short-term vehicle concept, are aligned with this **overarching goal**, not solely focused on medium-term objectives.

Based on this long-term perspective, we have two primary team objectives:

- Cultivate a team that is more **united** than ever, capable of working in unison like other renowned teams in terms of **dedication** and **team spirit**.
- Complete **all** dynamic events at the **FSG competition in 2025** with success, encompassing both **manual** (EV) and **autonomous** driving (DV) challenges.

Our prototype’s objectives are derived from the team’s goals, emphasizing **reliability, cost-efficiency, moderate performance, and autonomous-driving**.

The next two years will be intensive as the team embarks on the

journey to conceptualize, design, validate, manufacture, test, and compete with both an EV and DV prototype. Simultaneously, we will conduct **extensive testing** of our FSFEUP 01 prototype in the short term.

Additionally, we will integrate **autonomous-driving** capabilities by mechanically incorporating sensors and actuators, based on software developed by the Autonomous Systems department. This will initially be implemented on our 01 prototype, with the aim of transferring this knowledge to the development of our **second prototype**.

© FSG, Seizinger

During the winters of 2024 and 2025, we will also focus on training for the **rigorous quizzes** required to secure limited slots allocated to each competition.

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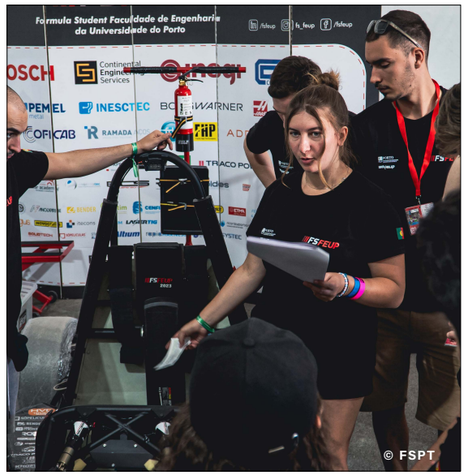
In order to ensure all of these objectives are acomplished, a systematic, clear and well defined approach must be taken. To do this, a **Systems Engineering approach** is being introduced to the team. Allied to a clearly defined team structure, responsibilities and daily operations like meetings, documentation and protocols, we are sure this is the step that will aid the team into achieving the **next level**.



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RECRUITMENT

CREATING THE NEXT GENERATION OF YOUNG ENGINEERS

The team will soon start the recruitment process - as was stated previously, FS works in cycles. This will be open to **all** of the University of Porto students, whose Uni we are representing!

This is an exciting chance for the team, as historically it has been quite clear that our team improves in every single recruitment. We are convinced that there are numerous **talented and motivated** students ready to join and quickly have an impact on the development of our next prototype.

The team will have an **open day**, during the 23rd of September, open for all of the Uni Community, where we will showcase how the team works and develop further **technical explanations** regarding each Department.

By the 24th of September, the registration forms will open and then the recruitment process formally begins!

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SPECIAL THANKS

A MESSAGE TO THOSE WHO HAVE MADE EVERYTHING POSSIBLE

"It is with a high sense of responsibility that we, as a team, enroll on the next cycle. The foundations for a long lasting team have been done and it is now a priority to make sure that FSFEUP becomes an ever improving team. To develop a great team - which is our main focus - inexorably means to design and manufacture an excellent prototype. The next short-term steps are critical in shaping the future of our team, these include the recruitment, 01 testing, design of 02 and implementing autonomous-driving capabilities on our 01, but I'm sure that we will succeed as a team - which is more motivated than ever! I would personally like to express my gratitude to all the sponsors, institutional partners, educators and families, that enabled us to reach our maximum potential during our first team cycle. As a team we are all focused and well motivated to keep improving and keep pushing both ourselves and engineering forward!"

-Miguel Damião, Team Leader

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END.

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