

EVENT HANDBOOK

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FORMULA STUDENT EAST



FSSymposium

FSS|ONLINE

Formula Student has always been an educational event with a motorsport theme.

Hundreds of teams all around the world perform at their best in car development, project management and interdisciplinary fields that are essential to build a single-seater formula racecar and successfully participate in an engineering design competition.

Even though the accomplishment and recognition of all their work is normally delivered during the competitions, a constant demand for new inputs and advices on racecar design from leading experts also exists.

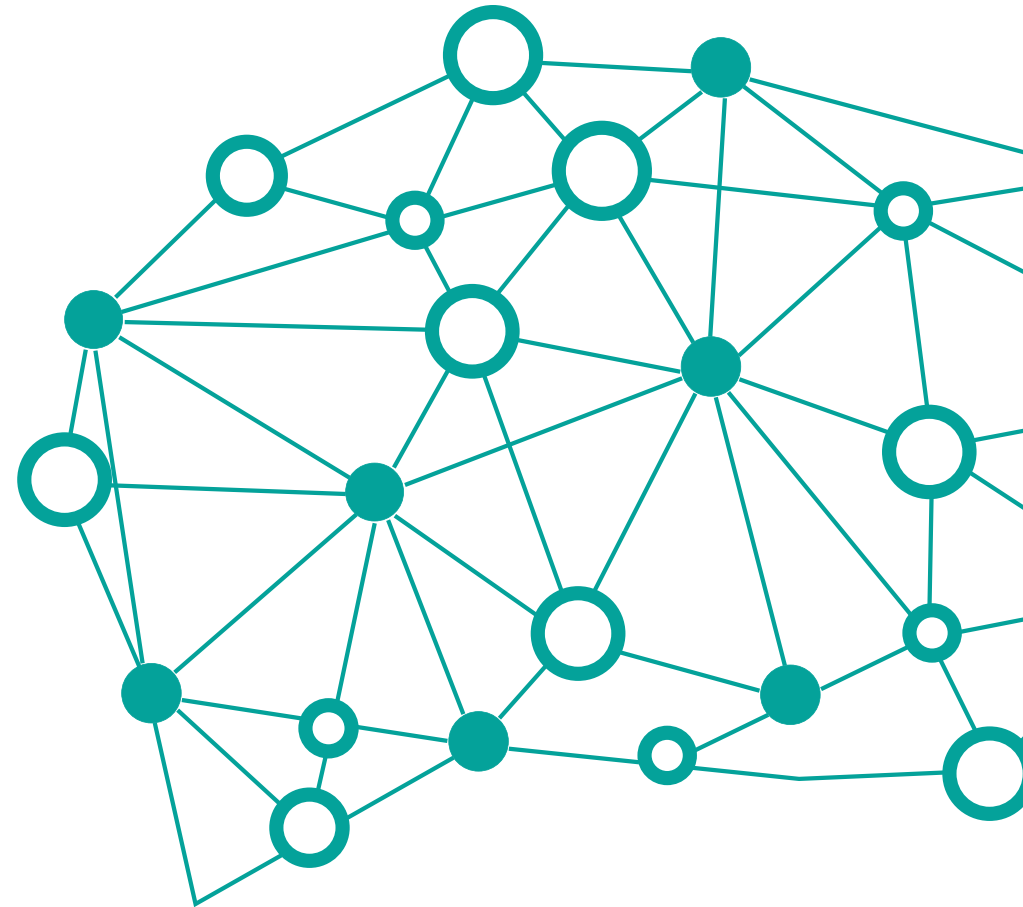
Considering this interest, the Audi Hungaria Faculty of Automotive Engineering at Széchenyi István University has been organizing Formula Student Symposium with highly recognized speakers from motorsport for the past couple of years.

This year however has been vastly different in many ways.

The coronavirus pandemic swept away a part of our normal lives and also rewrote the way we think about events. The academic world has moved to teaching and working together using digital technologies in an amazingly short time.

Embarking on that experience, we decided to move Formula Student Symposium Online, as the attendees' health and safety are one of our top priorities.

The Symposium might be virtual this year, but the fundamentals are the same: we are doing everything we can to create the best possible experience for you, and to make sure that Formula Student Symposium - Online will be a truly special and great educational event where you can grow yourselves and regain the edge for the coming season.



INFO

Officials

Officials are responsible for running the event and being your point of contact any time you need something. Do not hesitate to contact them if you need to!

Official Communication

All schedule changes and event modifications will be announced on the event's Facebook and Instagram pages as well as by our speaker.

Unsuitable behavior

Be respectful. Harassment and abuse are never tolerated. If you are in a situation that makes you uncomfortable at the event, if the event itself is creating an unsafe or inappropriate environment, or if interacting with an official or event organizer makes you uncomfortable, please report it to the event manager.

Harassment includes but is not limited to offensive verbal or written comments related to gender, age, sexual orientation, disability, physical appearance, body size, race, religion, social class, economic status, veteran status, sexual images, deliberate intimidation, stalking, following, harassing photography or recording, sustained disruption of talks or other events, inappropriate physical contact, and unwelcome sexual attention.

If what you're doing is making someone feel uncomfortable, that counts as harassment and is enough reason to stop doing it.

Participants asked to stop any harassing behavior are expected to comply immediately. If a participant engages in harassing behavior, FS Symposium Officials may take any action they deem appropriate, including warning the offender or expulsion from the event with no eligibility for refund of any type.

Tickets

All FS team members may only be registered by an appointed Team Responsible. The registration fee for 1 team responsible plus max. 15 additional team members is 100 EUR + VAT in total.

Please note that we can receive payments only by bank transfer. Pro forma invoice will be sent to Team Responsible within 10 days after registration in order to accurately determine the due amount of VAT. The amount of VAT may vary according to the billing data (residential and VAT identification number) that you provide during the registration process. Please note that we cannot accept any modifications on the given data once the registration process is completed! Do not forget to put [Order ID] and [Team name] in the 'note' on bank transfer!

Registration Process

1. Team responsible buys the ticket on the website
IMPORTANT - billing data cannot be changed after registration.
2. Within 10 days, Team responsible receives pro forma invoice for 100 EUR + VAT
 - **IMPORTANT** - VAT amount will be determined based on billing data provided by Team Responsible. e.g.: 27% VAT is applied to domestic teams, teams with EU domicile indicating their VAT ID are VAT exempt, etc.
 - e.g.: 27% VAT is applied to domestic teams, teams with EU domicile indicating their VAT ID are VAT exempt, etc.
 - **Clarification:** due to the online nature of the conference, the applied VAT depends on both the team's home country and domestic taxation rules. Information about the applied VAT amount can be provided individually to teams upon their request.

3. Team responsible pays pro forma invoice until the due date.
4. With the arrival of the sum, vouchers are sent out to purchase the additional member tickets at 100% discount.
5. Team responsible registers members for the additional tickets **UNTIL 27TH OF NOVEMBER 19:00 CET** (no changes).
6. 27th of November after registration closes
- Zoom links sent out to Teams
 - Notice: two webinar links will be sent, one for Day 1 (Saturday, 28th of November, 2020) and one for Day 2 (Sunday, 29th of November, 2020)
7. 28th of November from 9:00 CET - all participants log in to the Day 1 Zoom Webinar using their individual links received in e-mail
8. 29th of November from 9:30 CET - all participants log in to the Day 2 Zoom Webinar using their individual links received in e-mail

Platform

1. The official conference platform will be a Zoom Webinar. Browser version of Zoom should be sufficient, but for the best experience, it is recommended to download the Zoom desktop application.
 - Speakers' corner will be conducted through regular Zoom meetings, with an individual meeting for each speaker. See the section for Speakers' corner for further details.
2. Link to join the official webinar will be sent out in an e-mail to each participant.
3. Participants must use their own individual links to join the webinar.
4. Only one device is allowed to be logged in using one link at any point in time.

SCHEDULE

Session Info

Two session types are available at FSS 2020. The main difference lies in the amount of interactivity offered to participants:

Plenary lecture: offers a more general topic with broader applicability to Formula Student. Q&A will be opened after the 45 minute lecture. Participants will either be connected into the webinar by using the “Raise Hand” command, through their own camera and microphone or will be able to post questions in the Q&A window.

Technical session: deeper discussion of a specific technical discipline. Q&A will be open throughout the entire 60 minute session using both the “Raise Hand” command and the Q&A window.

Q&A moderation: the conference moderator reserves the right to moderate questions from the Q&A board and read out only selected ones.

Speakers` corner:

Speakers` corner is a chance for you to ask your burning questions from our renowned experts in a less scripted session. There will be no presentations and no prompts here - your questions will guide the conversation, so you best come prepared. Each speaker will have their own Zoom meeting, lasting from 17:30 to 18:45 CET. Each team member will be able to join one speaker`s room. Maximum capacity of each Zoom meeting is 50 people, plus the speaker and one moderator from the FSS Officials team.

Registration: Registration for the Speakers` corner session will be available through Ticketninja. Registration opens at 8:00 CET on the 27th of November and closes at 23:55 CET on the 27th of November. Slots are assigned on a first come-first serve basis. Each team member must register on their own through their own Ticketninja account.

Zoom links to each room will be emailed to registered team members after registration closes. Speakers` corner meetings will be opened for joining at 17:15 CET on 28th of November, session starts at 17:30 CET and finishes at 18:45 CET. FSS moderators have the right to ban participants for unacceptable behavior, including but not limited to harassment, sharing unsolicited content and disrespectful manners (see section “Unsuitable behavior”).

DAY 1 Saturday / 28 Nov

09.00 – 09:30	Joining Day 1 Zoom Webinar
09:30 – 10:00	Opening ceremony
10.00 – 11.00	Resources and requirement for Formula Student – Owen Carless
11.00 – 12.00	Project backbone: Setting up your team to get the best out of the season – Igor Felc
12.00 – 12.15	Break
12.15 – 13.15	Conceptual Design of F1 and MotoGP engines – Luca Marmorini
13.15 – 14.00	Lunch break
14.00 – 15.00	How to get the most out of your engines using a dyno – Markus Nenzel
15.00 – 16.00	Theory and good practices is suspension kinematics design – Claude Rouelle
16.00 – 16.15	Break
16.15 – 17.15	Grip, balance, control and stability – Claude Rouelle
17.15 – 17.30	Break & Joining Speakers` Corner meeting rooms
17.30 – 18.45	Virtual Speakers` Corner

DAY 2 Sunday / 29 Nov

09.30 – 10:00	Joining Day 1 Zoom Webinar
10.00 – 11.00	Lessons from the Skunk Works – Pat Clarke
11.00 – 12.00	Model-Based Controls Development – Using the benefits of Simulink and Speedgoat Hardware – Cristoph Hahn & Michael Lüthy
12.00 – 12.15	Break
12.15 – 13.15	From combustion to electric – a great challenge, a big chance – David Falser & Jordi Prats Valero
13.15 – 14.00	Lunch break
14.00 – 15.00	Strategy in vehicle dynamics simulation software development – Claude Rouelle
15.00 – 16.00	The importance of complex thinking in designing a racecar – Sandor Kling
16.00 – 16.15	Break
16.15 – 17.15	Composite Monocoque Engineering – Owen Carless
17.15 – 17:30	Closing Remarks

All times are in CET,
GMT+1

SPEAKERS

**LUCA MARMORINI****Marmotors**

Former head of engine development at Ferrari and Toyota F1

Luca Marmorini has been an instrumental figure in two renowned Formula 1 teams throughout his decades-long career in professional motorsports. At both Ferrari's and Toyota's F1 efforts, he oversaw the development of powertrains for a wide variety of regulatory requirements. This means that besides naturally aspirated classical racing engines, he also has thorough and deep understanding of modern hybrid, turbocharged technologies as well. His appreciation for Formula Student means that your topics and interest excites him, so make sure to take advantage of your chance to speak to him in our sessions!

**PAT CLARKE****Formula Student patron**

Design Judge in FS

Commonly regarded as one of the patrons of the entire Formula Student movement, Pat focuses on keeping common sense in the competition while encouraging teams still to develop.

Practical and simple recommendations from him lead to streamlined designs and the ability to find the most effective improvement areas in each team.

With years of experience in FS design judging, he is able to point towards good practices and ask you to realize mistakes he has recorded.

**CLAUDE ROUELLE****Optimum G**

Vehicle Dynamics expert & President

As one of the most experienced judges and earliest proponents of the movement, Claude is a legend in Formula Student. His concise, simple-sounding questions test the absolute fundamental understanding of vehicle dynamics.

However, he does not shy away of delving deep into theory and equations to explore the complex processes in the suspensions systems of racecars.

On top of all this, as the head of a company, he also understands key aspects of team building and project organization, so his insights are valuable both for novice and experienced teams not only in vehicle dynamics!

**OWEN CARLESS****Red Bull Racing F1**

Head of Structural Analysis

Owen Carless has been working with the Red Bull Racing Formula One team for a little over twelve years now and gathered a huge amount of experience in his seven years of being a Chief Design Judge on FSG.

Spending this amount of time at the pinnacle of motorsports, Owen has more than enough expertise in composite structures, while as a chief design judge he has the ability to oversee the functioning of many teams each year; so make sure to not miss either of his presentations!

SPEAKERS

**SANDOR KLING****Red Bull Racing F1**

Composite Structure analyst

Sandor Kling has reached the uppermost echelon of motorsport by being one of Red Bull Racing's engineers for a number of seasons.

Not only is his career path very interesting and provides inspiration for how to get to your dream job from Formula Student, but his engineering expertise regarding composite design and complex design methods are also essential if you want to take your car to the next level!

**IGOR FELC****Rimac Automobili**

Senior concept engineer

To keep with the theme of FS-experienced presenters, Igor Felc has had significant experience by being part of a Formula Student team during his university years as well.

His current work at Rimac Automobili requires many of the skills he obtained during Formula Student, and his multidisciplinary approach to projects and organization skills definitely are worthy to listen to during his sessions.

By being a judge in recent years at multiple major FS competitions, he also understands new challenges teams are facing and is happy to help out with general management topics!

**MARKUS NENZEL****Team Leader, Engine**

Rennstall Esslingen

With 10 years of experience building formula student race cars, including the calibration of 3 different outstanding engine concepts, and 5 years as an engineering design judge, Markus definitely has some experience and a really good and thorough understanding of the beautiful and complex world of Formula Student.

Compiling this experience and his profession, Markus will show you how to use a dyno and tune a race engine fast, efficient, and thinking out of the box.

**CRISTOPH HAHN****Speedgoat**

Content Developer Manager

Having spent more than five years at MathWorks as a Technical Education Specialist and now a year at Speedgoat as Content Developer Manager, Christoph Hahn certainly is no stranger to education and building virtual car simulation models; while also staying close to the world of Formula Student with being an Engineering Design judge since 2013 on FSG, FSUK, FSAE, and FSI.

Given his expertise and today's automotive trends, we highly recommend taking part in their lecture with his colleague and getting up to speed with modeling, computational mechanics, and the validation of simulation approaches.

SPEAKERS

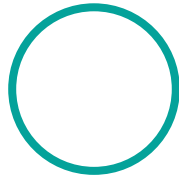


MICHAEL LÜTHY

Speedgoat

Automotive Industry Manager

Michael Lüthy has been the industry expert in the automotive sector at Speedgoat for three years. He has gained first-hand experience about the industry trends and needs when developing and testing new controls through his work with customers. Using these insights, he is driving Speedgoat's goal to continuously improve their solutions for real-time simulation and testing that help automotive engineers develop the future of mobility.



Furthermore, together with Christoph Hahn, he coordinates Speedgoat's efforts to sponsor Student Formula which intend to foster the next generation of automotive engineers together. Given his expertise and today's automotive trends, we highly recommend attending his joint session with his colleague, Christoph Hahn and AMZ and Greenteam FS Teams to get up to speed with modeling and using real-time hardware analysis for the validation of control system designs.



DAVID FALSER

TU Graz Racing Team

Accumulator Responsible

Studying electrical engineering and having spent 4 years building ICE Formula Student cars, in 2019 he thought that it was time to build an electric car for the season 2020.

This turned out to be a bigger project than expected, but now he hopes that he can help in motivating other teams to do the same.



JORDI PRATS VALERO

TU Graz Racing Team

High Voltage Department Leader

Originally from Spain, Jordi moved to Graz in 2016 to work for AVL. During his study times, he was part of two Formula Student teams and he decided to join the TU Graz Racing Team after starting a Master and getting to know that their next car would be electric.

Soon after, and by surprise, he was appointed responsible for the implementation of the new electric powertrain, which ended up being a really interesting challenge, and he is ready to tell you about it.

SESSIONS 28 NOV

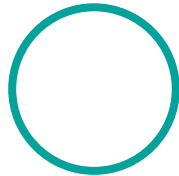


RESOURCES AND REQUIREMENT FOR FORMULA STUDENT

Owen Carless

The technical challenges posed by Formula Student competitions, allied to tight time-scales and financial constraints, mean that it is essential for teams to work as efficiently as possible in order to succeed.

This lecture will cover the importance of setting good targets for Formula Student and then translating them into proper engineering functional requirements that form the basis for the design.



Effective allocation of resources and the technical planning required to achieve the team's targets will also be discussed, as will monitoring and adapting of plans during construction of the car.

This lecture will also address how to test and validate the components and sub-systems as well as the finished car, and is suitable for anyone involved with a Formula Student project.



PROJECT BACKBONE: SETTING UP YOUR TEAM TO GET THE BEST OUT OF THE SEASON

Igor Felc

An overview of how to get your team to achieve the optimum results by aligning your team goals and strategy to the available resources you have (time, budget, and competencies).

Taking some examples, effects of goal distribution and resources on the vehicle concept and an overall development cycle are explored.



CONCEPTUAL DESIGN OF F1 AND MOTOGP ENGINES

Luca Marmorini

Internal combustion engines in racing applications are not only powerful but at times must be very efficient as well, especially when regulations limit the amount of energy available on board.

Innovative concepts and inventive thinking must be combined with thorough understanding of component endurance limits and factors of reliability, since failure is not an option when success is a goal.

With his wealth of experience, Luca Marmorini will introduce you how to lay out engines for different applications taking into account the varying requirements of vastly different racing disciplines.

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HOW TO GET THE MOST OUT OF YOUR ENGINES USING A DYNO

Markus Nenzel

You have an engine, customized components, measuring technology and you want to calibrate your engine as well as possible.

Follow me on a journey through the “dyno world”. Let’s talk about different dyno types, which measurement technology is a must have, which is nice to have. Let’s see how to calibrate an engine in a short period of time and thinking out of the box.



THEORY AND GOOD PRACTICES IS SUSPENSION KINEMATICS DESIGN

Claude Rouelle

In this presentation, Claude will explain what are the chronological steps that a good car designer should use to design good suspension kinematics.

Claude will explain how to define camber variation in heave, roll, and steer, roll and pitch centers position and movement, Ackerman, bump steer, steering torque, motion ratio, and compliance minimization, and from there how to decide your car suspension pickup points coordinates.

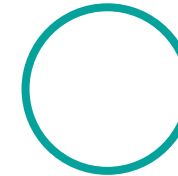


GRIP, BALANCE, CONTROL AND STABILITY

Claude Rouelle

With drivability and energy consumption, lap time and lap time consistency are the ultimate measurements of a car’s performance. Students often rush to the creation and/or exploitation of lap time simulation that is then often used as a “black box” without always understanding why some inputs influence their car lap time.

There are several simple tools that car designers should use before lap time simulation to qualitatively



and quantitatively comprehend the influence that some specific car design and setup parameters have on easily quantifiable performance criteria.

Claude will explain how to create and exploit such tools during the concept phase but also on test and race tracks with the engineers and drivers.

SESSIONS 29 NOV



LESSONS FROM THE SKUNK WORKS

Pat Clarke

Lockheed Skunk Works achieved some of the major breakthroughs in aviation which was in no small part thanks to the management style of the division's director, Kelly Johnson. His rules provide guidance to all working on highly technical projects within serious time constraints - something Formula Student participants know very well.



MODEL-BASED CONTROLS

DEVELOPMENT – Using the benefits of Simulink and Speedgoat hardware
Cristoph Hahn
& Michael Lüthy

This session will guide attendees through the workflow of developing and testing control systems. We'll cover model-based design using Simulink and controller prototyping on VCU-like hardware.

The benefits of modular and powerful real-time target hardware for testing and development will be illustrated.

Early use of the final controls hardware allows you accelerate the workflow from defining requirements, through testing, to final deployment in the car while ensuring robust behavior throughout.



FROM COMBUSTION TO ELECTRIC - A GREAT CHALLENGE, A BIG CHANCE

David Falser
& Jordi Prats Valero

As the prototype of the car will typically be available only late in the season, we'll focus on dedicated aspects of vehicle modeling, too, to highlight the importance of testing controls algorithms early in a hardware-in-the-loop setup.

We are proud to announce that both AMZ Racing (ETH Zurich) and Greenteam (U Stuttgart) will present their use cases in the talk and be available in the Q+A.

The session is primarily targeted for teams developing electric powertrain racecars but is not restricted to them.



Every year multiple Formula Student Teams all over the world change their focus from building combustion cars to electric powered race cars.

This has multiple reasons, the biggest one is probably the change of focus within the automotive industry to electric driven cars. But that is not the only reason why you should do it. The real reason why you should switch to electric cars is because it gives you the opportunity to work on a very interesting project and are a lot of fun to build and drive.

CONTINUE ON NEXT PAGE...

SESSIONS 29 NOV



STRATEGY IN VEHICLE DYNAMICS SIMULATION SOFTWARE DEVELOPMENT

Claude Rouelle

Electric and combustion driven Formula Student cars seem to be quite similar if you just look at them from the outside, but if you take a closer look, many differences show up. From the simple fact that now you must fit 40 kg worth of battery cells in an already very tight car, to the introduction of control strategies for the electric motors, several new challenges appear.

We want to talk about these challenges and how we faced them by switching from combustion to electric in one year.

Claude will explain what a good simulation software is from the perspective of the end-user; the car designer and test and development engineers. He will share with the students the typical mistakes to avoid and offer a strategy in the creation of their own vehicle dynamics simulation.



THE IMPORTANCE OF COMPLEX THINKING IN DESIGNING A RACECAR

Sandor Kling

Formula 1 is a dream of many Formula Student team members - and for many, it can be realized.

Sandor Kling's career has taken him from where you are now to where you want to be after graduation, and his session will show you how your current work prepares you for a position in the king category of motorsports.

Project management and design method similarities will be explained with actual examples taken from FS and F1 car projects, so make sure to tune in for some exciting motorsport content!



COMPOSITE MONOCOQUE ENGINEERING

Owen Carless

Formula Student teams from across the world have developed alternatives to traditional tubular frame chassis designs over the last fifteen years, and today these have reached a high level of sophistication. Starting with consideration to the overall layout and packaging of the car, this seminar will explore the design of a composite monocoque and will include discussion of the available materials technology, ensuring rules compliance for Formula Student events, and design for manufacture.

Finite-element simulation methods will also be presented, and the seminar will explore options for validation of the completed monocoque.

This seminar is suitable for anyone with an interest in developing chassis designs with a particular focus on composite monocoque engineering.

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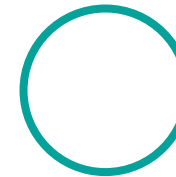
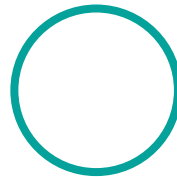
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