August 2023

Nittany Motorsports is ready to start the new school year! This comes with new designs, new leadership, new members, and even a new name. We look forward to our second year as a Formula SAE-EV team and are excited to bring you along with us.

We are going back to our monthly newsletter schedule starting with this one. Continue reading below to see how our team is rolling into the new year!
Dear Nittany Motorsports Supporters,

I am Joel, and I proudly serve as the Captain for Nittany Motorsports in the 2023-24 season. I want to begin this message by expressing our heartfelt gratitude. Our success wouldn't be possible without the dedication and support from those who contributed to the car's design, provided technical assistance, or made generous donations. Your contributions are the lifeblood of our club, and we deeply appreciate your unwavering support.

We are eagerly looking ahead to showcasing our latest competitor for the 2023-24 season. Throughout the summer and the initial weeks of the semester, we've welcomed a wave of new members to our team. Our commitment to growth extends beyond the realm of engineering. Last season, we actively recruited students from non-technical majors, and this year, we've intensified our efforts. We're proud to report our successful recruitment from the Bellisario College of Communications, the College of Arts and Architecture, and the Smeal College of Business, as numerous new members now represent these colleges within our ranks.

Our team leads and project managers have dedicated countless hours over the summer to refine their designs. With an array of fresh innovations and concepts, we believe that our presence in Michigan will feature one of the finest vehicles that Penn State has developed in recent memory.

As we settle into the rhythm of the semester, everyone is readjusting to university life. Subsystems have already commenced their meetings and are brimming with enthusiasm for the year ahead.

Once again, I extend my heartfelt thanks for your invaluable support.

Sincerely,
Joel VanSkiver
Team Captain, 2023-24
MECHANICAL ENGINEERING
JUNIOR ORIENTATION
We attended the New Junior Orientation for the Mechanical Engineering Department! We briefly presented on who we are and what we do, and then spoke with new ME students about our team and how they can get involved. We even brought our car out to Reber parking lot (pictured to the side)! Thank you to the ME department for having us!

ARTS AND ARCHITECTURE
INVOLVEMENT FAIR
For the first time ever, Nittany Motorsports attended the College of Arts and Architecture Involvement Fair. We had a blast speaking with students and with A&A Clubs, Faculty, and Staff. We look forward to connecting with and recruiting from A&A more often! Thanks to the College of Arts and Architecture for having us!

BELLISARIO INVOLVEMENT FAIR
We attended the Bellisario College of Communications Involvement Fair—also another first for team recruitment efforts. It was a great experience connecting with Bellisario students and we hope to connect with them more throughout the year. Thanks to the College of Communications for having us!

HUB INVOLVEMENT FAIR
We participated in the annual HUB Involvement Fair! In addition to our booth on the HUB Lawn, we also set up our car outside of Kunkle Lounge to show prospective members. It was a great day filled with fun questions and interest from new members. Thank you to everyone who helped out with the event!

BLUE ORIGIN SHOP VISIT
Blue Origin stopped by the shop towards the end of August to visit our members and see our car. We enjoyed talking with their representatives about our team, and Blue Origin career opportunities. Thank you Blue Origin for your interest and support for our team!

RESUME REVIEW WORKSHOP
To prepare for the upcoming career events this fall, our Systems Integration Lead and our Outreach lead hosted a resume review workshop for members. Josh and Becca answered career questions, looked over resumes, and gave our members advice on how to navigate career events. Thanks for helping our members!
Aerodynamics has been busy with all 4 subgroups: Aero Design, Structures, Manufacturing, and Testing/Validation. We have nearly finalized the front wing designs, and are just waiting for confirmation on the front-end chassis geometry and the front wheel placement to freeze the design. We have also begun rear wing main element selection, looking to improve the manufacturability of the airfoil compared to last year’s while maintaining or increasing the performance. Structures has begun making more concrete front wing mounting in CAD now that the front wing design is largely done. We are looking at some innovative methods that will be lightweight, aerodynamically sound, and easy to mount.

The vehicle testing group has finished running our Matlab lap time simulations to establish a relationship between dynamic event points and drag/downforce, which has been used to evaluate each iteration of our aero designs. We are also preparing for our first track days over the coming week where we will be able to compare the car’s real performance to its simulated one in Matlab. Last but not least, our manufacturing group has ordered and received the necessary materials to begin manufacturing tests. We will be hot-wiring some airfoils early in the coming week and will then test some materials/manufacturing methods that the team has never used before, aiming to reduce weight while improving accuracy and surface finish.

Chassis

This month marks the start of the 2023-24 Nittany Motorsports car design! Chassis has been busy over the summer with preliminary designs for our second full monocoque chassis. We’ve done 3 Chassis v. World meetings and we are now making progress. Chassis v. World meetings are where representatives from every subsystem come to make sure all designs are cohesive with the chassis and vice versa. We’ve managed to survive all three, and we’re cruising with our design. We have also selected our 4 project managers for this year to focus on the firewall, roll hoop, front impact, and molds.

We also welcomed new members at the end of August by laying up an airfoil with them. Spoiler alert, it didn’t work very well, but we are ready to apply this knowledge to better our future layups. We are very excited for this year and can’t wait to show off the chassis when we finish.
Controls, Brakes, and Safety

A new school year brings new and exciting times! CBS has been hard at work this summer doing research and preliminary design work. Now that we are back on campus, we have been recruiting members to join us for the season! We are excited to bring the new members up to speed and really start our design work for the new car. Most efforts will consist of design iteration from the previous car. We did a fantastic job with our designs last year, so this year the focus is finding specific areas to improve. This time next month we plan to have some early drafts of our mechanisms and components to share!

Drivetrain

Drivetrain has been working hard throughout the beginning of August by having virtual meetings. We first identified what the major projects will be moving forward and determined the best course of action to get them completed in a timely manner and with no mistakes. Gantt charts were made, and the designs began to be iterated. Before the semester started, we selected 4 project managers to hit the ground running when the semester started with our major projects! The projects and project managers are listed below:

- Motor Mount – Jonathan Quarrick
- Differential Mount – Zachary Mosier
- Cooling – Dade George
- CV Joints/Half Shafts – Nick Karpowicz

Once the semester began, it was time to recruit new members! After attending the ME Junior orientation, involvement fair, college arts and architecture involvement fair, and the college of communications involvement fair, we are happy to report that the first in-person Drivetrain meeting had 33 attendees! We are excited to welcome the new members to Drivetrain and get everyone in a position to learn as much as possible! The project managers are now beginning to assign many of the design tasks associated with each respective project so that the new members can quickly gain hands-on experience. With track days quickly approaching, we have identified that we are going to test ramp angles on the differential to see how they affect the drivability of the car, as well as adding coolant temperature sensors to record data to aid in the design of the ‘24 car’s cooling system. We look forward to making even more progress on design in the month of September and can’t wait to record useful data at track days!
Finance

Finance has had a busy start to the beginning of the semester. We have been hard at work reconnecting with past sponsors, connecting with current sponsors, and reaching out to possible new sponsors. The team has also been working with all of the new members in the team to make sure everyone is up to date on the resources within the team that have to do with the finance subsystem. We have also spent time coming up with ways to fundraise in the future and ensure that Nittany Motorsports has the funds available to be a strong and successful team for all current and future competitions. The Finance team is looking forward to the rest of this school year and putting the work in to ensure success in this year’s competition.

High Voltage Electronics

HVE is getting back into the school routine. We had a great first week of school and recruitment is at an all-time high. With close to 200 members at the new member meeting and around 50 in the first electronics meeting (including returning members), we are looking forward to a great year! HVE spent a good amount of time in the shop this week getting last year’s car running again. We had to chase some loose connections and fix a few broken connectors. We are planning on our first track day this Sunday 9/2/2023.

As for future plans, electronics as a whole is focusing on project delegation to better spread responsibility and learning to our growing member base. This is working fantastically so far as project managers are going full throttle on designs. For HVE, our largest physical project will be re-working the accumulator. We will be re-doing all the wiring and manufacturing a large portion of the container. We will be reusing the same 18650 VTC5a cells from last year as they were barely used. We are additionally looking into several RnD projects such as a custom BMS, custom motor controller, and more exotic battery geometries. We are off to a great start and are looking forward to the season!
Low Voltage Electronics

This month on Low Voltage, we determined our project managers for the semester and presented the projects to the new members of electronics. The project leaders are as follows: Eric W. and Eric J. leading wiring harness, Phil H. leading Mega-board front, Chris M. leading Mega-board rear, Nick. K leading software development, Jacopo D. leading the wireless communications link, Kyle G. leading traction control, and Rishab S. leading sensor integration. At our first full electronics meeting, we had over 40 members attend and show interest in all these projects.

For our circuit board design this year, we will be combining many of our existing circuit boards across two mega-boards that will exist in the front and the rear of the car. We will also be putting further development into our wiring harness design, which will greatly simplify the complexity of the vehicle system. The wireless communications link we are adding will allow wireless data transfer from the vehicle to the laptop for analysis, and the traction control will improve the vehicle’s ability to accelerate from a stop. Finally, sensor integration will work with the traction control team to add wheel speed sensors to the car along with sensors requested by other subsystems on the team.

Outreach

Outreach has hit the ground sprinting in August! With our new team name comes a whole team rebrand which has gone very well. Additionally, we were able to attend a vast variety of involvement fairs to diversify our recruitment efforts! Shorthand from the events page above, we attended the ME New Junior Orientation; the Arts and Architecture, Bellisario College of Communications, and the HUB Involvement Fairs. Each event allowed our members to speak with prospective members who brought wonderful energy, perspectives, and questions to our team. We have successfully onboarded over 200 people to our team, and we encourage them- regardless of major and experience - to join whatever subsystem they would like! All of the leads are very receptive and supportive of all members, and that’s certainly an Outreach win. We have even more events and merchandise upcoming in September; we’re super excited to support the team culture! Check out our social media pages @nittanymotorsports to stay updated!
**Suspension**

August has been a very busy month for the suspension subsystem. In the midst of preparing for the fall semester, we have made some great progress with our various projects. As mentioned, our goals for this upcoming year include improving the steering ratio and performing an in-depth analysis of the dynamics of the various components of the suspension of the car. Deva and Kaelea have been coordinating with CBS to replace our current Z-Rack steering rack with a better, and more responsive one. After generating a decision matrix comparing six possible alternatives, we decided to install the Hyper Racing HSM steering box. As well as swapping the new rack, we also are gearing up for our fall track days where we will set up and tune the car to analyze how different dynamic settings like camber, tire pressure, and shock pressure will affect the vehicle performance. Because we did not get adequate time to test these characteristics before we competed in Michigan over the summer, these track days will help us tremendously in validating our designs from last year, and making adjustments as needed for the next iteration of the suspension design used on PSR24.

Ethan and Deva also spent some time analyzing the TTC tire data to assess the benefits of switching to a smaller tire size. Currently, we run the 18” Hoosier LC0 compound, and we believe that a smaller tire, like the 16.5” of the same compound will improve the handling and the dynamic feedback that the driver receives. We are also researching how the LC0 compares to the R20 compound and this analysis will ensure that we choose the best possible tires for our car. We are very excited about the upcoming year and cannot wait to get a head start on our design and manufacture as soon as possible.

**Systems Integration**

The semester has started and Nittany Motorsports has hit the ground running. As the System Integration lead, the start of the semester is one of the busiest times of the year. The main goals of the semester for systems integration are to successfully integrate all the new members into subsystems, keep track of rapidly changing designs, facilitate the manufacturing process for early components, and coordinate communication between the nine subsystems. Throughout the month of August, I have collected information from each subsystem lead in regards to how many points they would like to score throughout the competition as well as overall design goals to achieve. Over the next month, I plan to hold a design review, a large-scale design meeting, and a specific component meeting involving multiple subsystems. If anyone receiving this newsletter would like to be involved in a component design review, please email me at jpk6130@psu.edu to coordinate a meeting time. I, along with all the other leads, look forward to the exciting opportunities the semester holds for us.
Sponsorships

Thank you to our sponsors for the year thus far:
- Altair, Altium, BEST Center, Calspan Tire Research Facility, MasterCAM, Penn State Department of Mechanical Engineering, Penn State Engineering & Entrepreneurship Program, Penn State Engineering Undergraduate Program, Penn State Institute of Energy and the Environment, Rapid Harness, Rock West Composites, SimScale, Stackpole Engineering, The Piper Group, Uline, Tenneco, and VI-Grade
We are looking forward to your continued support!

Acknowledgments

We would like to take the time to acknowledge the following groups:
- Our New Members - We are excited to have you on the team!
- The Learning Factory Staff
- The FAME Lab Staff
- The Larson Transportation Institute
And thank you to all others who have provided us with constant support throughout our switch to electric! We are looking forward to a great year of car development!

Contact Us

Joel VanSkiver
Team Captain
jpv5295@psu.edu

Zac Allen
Finance Lead
zwa5059@psu.edu

Becca Baker Outreach Lead
rab6214@psu.edu

SOCIAL MEDIA:
INSTAGRAM & TIK TOK: NITTANYMOTORSPORTS
LINKEDIN: NITTANY MOTORSPORTS
WEBSITE: HTTPS://SITES.PSU.EDU/PENNSTATERACING/