

Who are we?

We are a team of students spanning all four years of college education and all departments united by a shared love, “the love for automobiles.” This results in a close-knit team that is as efficient as it is excellent, and we are the official motorsports team of NIT Tiruchirappalli. Our team works hands-on to tackle every challenge and hurdle that comes our way, and this helps us think and work in a way that includes the creative and individual thinking of each member of the team. This has led us to be part of the top teams in India and we are among the top 10 teams in virtual dynamics and won 2nd place in Maneuverability event, BAJA SAE INDIA 2022.

Baja SAEINDIA is an off-road vehicle competition series organized by the Society of Automotive Engineers India (SAEINDIA). Student teams from all over India compete in multiple dynamic events, such as an endurance race, maneuverability course, sledge pull, hill climb, and acceleration event. They are also judged for their work in design, sales, cost, and marketing events held during the annual competition

Foreword

The COVID-19 pandemic has affected our plans for this academic year as it was hard to work physically fabricating the ATV. But thanks to our faculty advisor Dr. Nanda Naik Kora and Dean SW Dr. Kumaresan for allowing us to work in college. A special mention to Dr. Dalley Krishnan and the Student Council and Technical Council, NIT TRICHY for smoothening our re-entry process.

With such a short time for fabrication, we faced problems like delay-in-delivery of raw materials, manufacturing defects. The help of Dr.Paneerselvam and Siemens CoE, NIT TRICHY helped us to get Brake and Acceleration Pedals machined using VMC at Siemens CoE NIT TRICHY. We would also like to thank Dr.Ramesh for providing us with 3D printed fixtures for chassis welding. We are also grateful to Dr. K R Balasubramanian for his support in Automobile Lab.

This academic year was about the training of the third and second years of the club. We successfully fabricated and tested our new 4 wd atv and provided the required hands on training to all the members. The pandemic affected year had rendered an inexperienced group but through this year we have been able to make up for lost time. I am confident that the work done in college and the results of this year would motivate the club for the years to come.

Progress in 2021-2022:

Design Phase

For this BAJA season, we decided to go for a 4WD ATV to promote culture of innovation, improve our performance and to cope up with the rugged tracks and terrain at the event. The design innovation and computational evaluation of our ATV and the components were started during early 2021. By the end of August, we completed the design and necessary evaluations were done by us. During September, we had our Virtual Design Presentation to BAJA Committee and the suggestions told by the committee were considered and design re-iteration was done in that month. During December 2021, we had our static events, in which we were evaluated for our Design Ideology, Design Validation Plans, Design Failure Mode and Effect Analysis, Computational Analysis, Ease of manufacturability, Design Improvement.

Fabrication Phase

A short fabrication plan was made earlier during quarantine for optimal utilization of time and resources. Our fabrication phase began in late 2021 and we started making our Roll-Cage. Throughout the fabrication we faced several new challenges in the sub-assembly and assembly of our ATV. The fabrication of Roll-Cage included procurement of pipes of various dimensions, bending them for our requirements which are done by 3rd party manufacturers, profiling the same for welding them together. This was done by late December 2021. Parallely, suspension arms were made using fixtures and laser cutting of various mounts and gussets was done.

Drawings were sent for outsourcing components such as Differential, Reduction gear box, Knuckle, Wheel Hub, engine mount and adapters. We started the procurement of the OEM components needed for our vehicle. In the Statics event of BAJA 2022, we made manufacturing and cost report which was based on methodologies and cost incurred in this phase.

With the completion of manufacturing, assembling upon receiving and testing of individual subsystem components, we entered the assembly phase of our car by February 2022. This included packaging of components in the roll cage ensuring it satisfies required clearances and abide by the rulebook.

Testing:

In the virtual dynamic event, we parametrized the car using IPG Carmaker software and maneuvered it using driver commands on different tracks during December 2021.

We had one week of testing in March 2022 which involved tuning the car and understanding its behavior for different shock pressure, CVT (Continuously Variable Transmission) settings etc. This allowed us to properly identify the car setting required for the various events that we participated in. For tuning the CVT, we made use of rotary encoder that helped us to find the rpm of primary and secondary pulleys. In this period, the driver started getting adapted to the car and adjustments and settings suggested by the driver were considered and implemented.

Meanwhile, we fabricated spare components in case of breakdowns in the car during event.

Associations and Sponsors:

- VAP Precision Engineering
- Hi-Tech Engineering
- Polyhose
- AliTradelinks
- Amul
- Velman Carvings
- Sajas Electricals
- Conducted the workshop "AutoDrift" and event "Make-A-Thon" in collaboration with TECHANALOGY.

Future Initiatives:

- Machining more parts on-campus with the help of CNC Lathe and VMC machines in Siemens CoE.
- Considering Design for Manufacturing more intensively to save costs in manufacturing.

- Designing and testing of Shifter to enable Dynamic Shifting
- Design of Custom Cage for Primary CVT.
- Bringing in more sponsors and having more people to work on publicity and marketing of the team.
- Making more rigorous testing tracks.
- Creating an Electrical R&D team, for making a battery-powered ATV, for participation in E-BAJA in upcoming years.
- Conducting workshops exclusively focused on automobile engineering.
- Explicit analysis of Roll-Cage.

Core Members:

- Madhav Menon (111118085) – Captain
- Hirthick Kumaran (111118039) – Vice-Captain
- Tanishk Venugopal (111118112) – Treasurer
- Manoj Kumar (111118119)- Brakes Head
- Pratyush Kumar (114118066) – Marketing head and Suspension and Steering Head
- Challa Yachendra (111118019) – Chassis Head
- Vivekanandan (111118124) – DAQ Head

Faculty Advisor:

Dr. Nanda Naik Korra

Department of Mechanical Engineering

A TEAM PICTURE OF PSI RACING 2022 @ BAJA SAE 2022, NATRAX



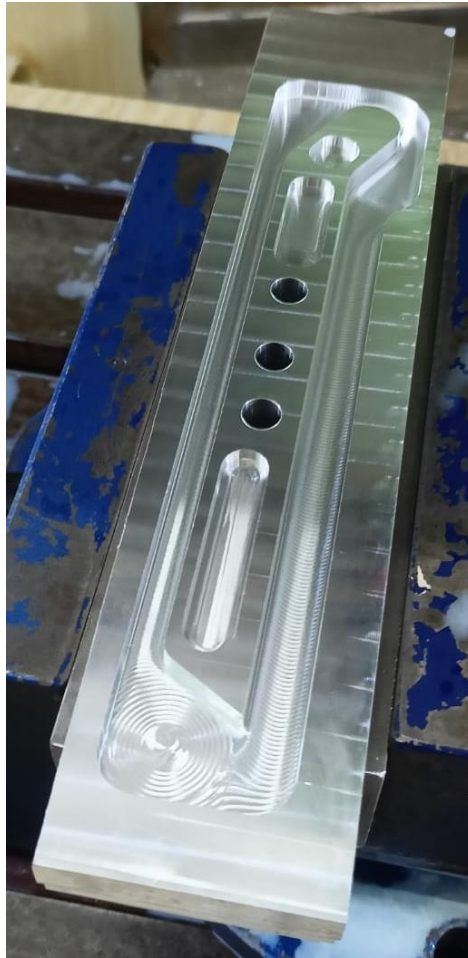
OUR ATV WAITING in-queue FOR BRAKES TEST AND ACCELERATION TEST



Glimpse of Technical Evaluation at the Event Site



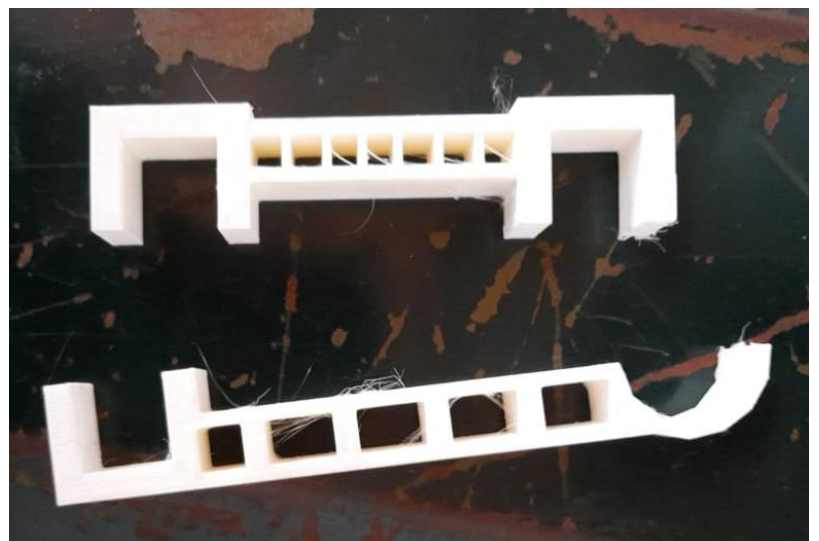
MACHINING OF PEDALS AT SIEMENS CoE, NIT TRICHY



Laser Cut Brake Rotors



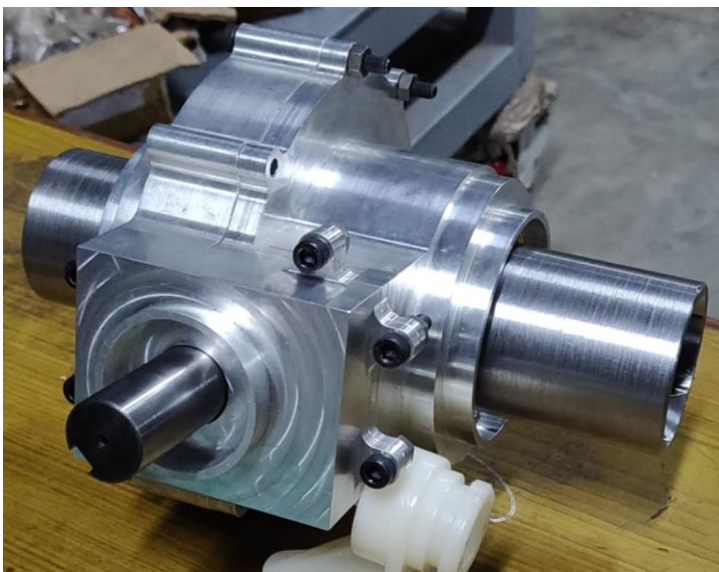
3-D Printed fixtures for welding



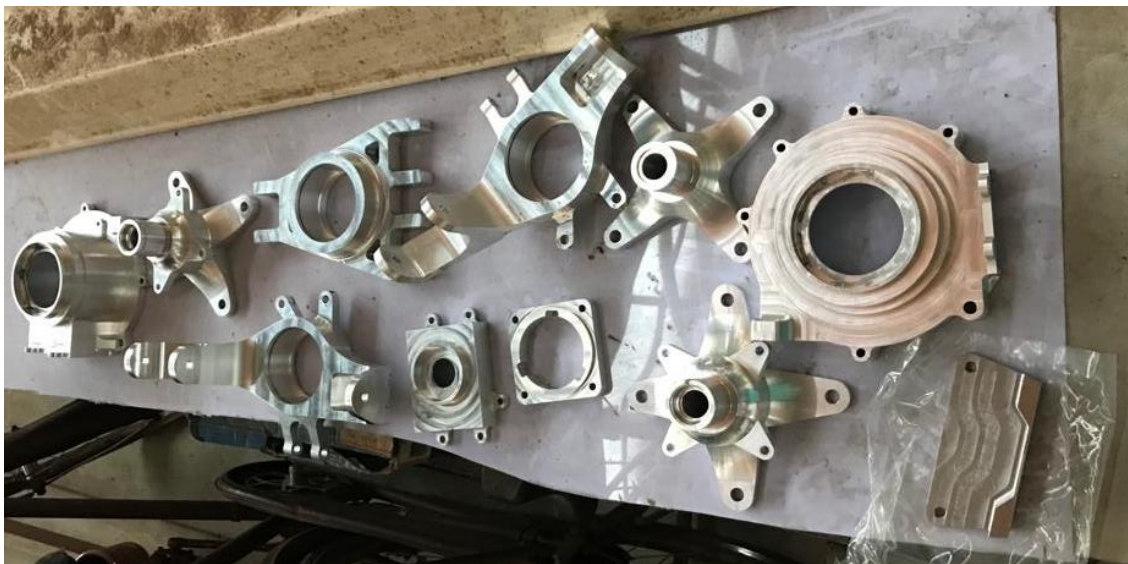
3D DIGITAL ART FOR NITT CONCLAVE METAVERSE



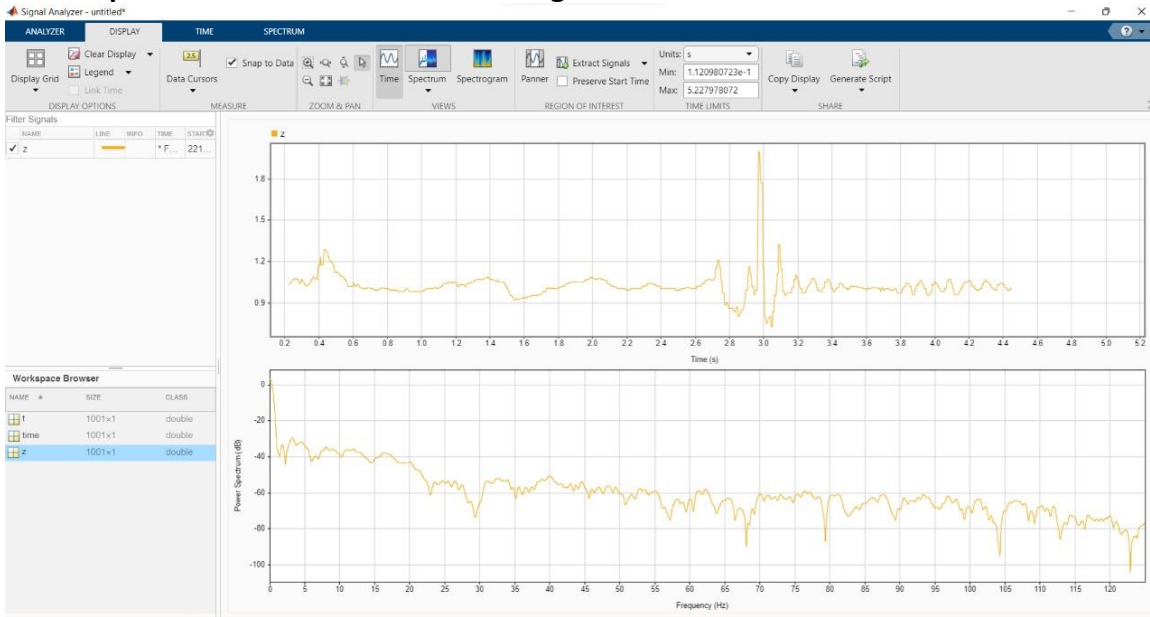
Differential Gearbox Assembly



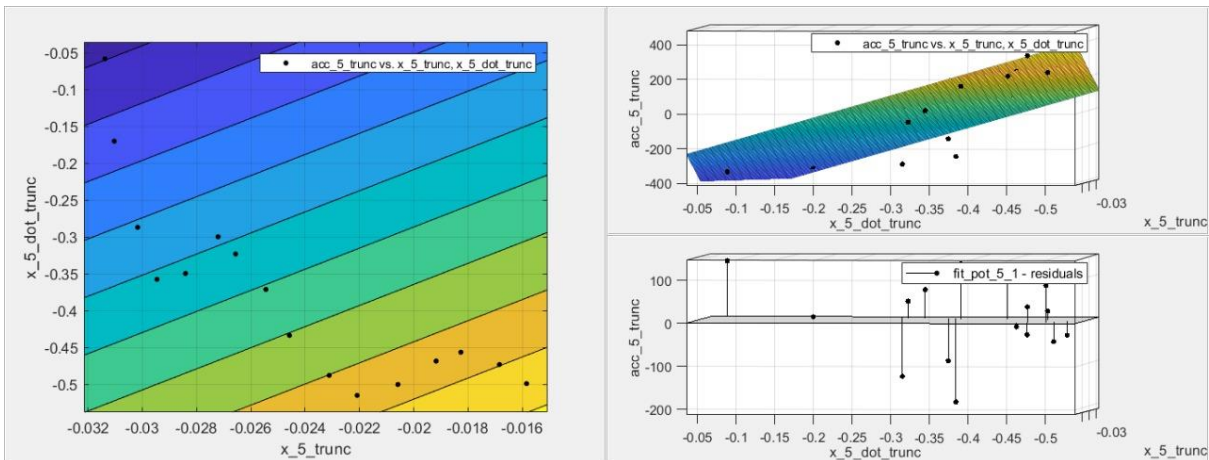
Casings, Knuckles, Hubs, Adapters



Bump Acceleration of ATV tested using ADXL345



Analyzing Shock Potentiometer and Accelerometer values for suitable suspension parameters



Testing GPS Module and Validation

