

Project ID:	P29	Client:	UTS Motorsports Autonomous
Project Title:	Autonomous Steering Mechanism	Affiliation:	UTS Student Teams

**Description:**

The project involves designing a mechatronic system which enables the steering mechanism on the 2022-2023 UTS Motorsports FSAE car to be controlled autonomously. The steering system consists of a steering wheel, universal joint linkages and a steering column into a worm drive steering rack (see figure 1). The engineer must consider ergonomic constraints as the vehicle must be both manually and autonomously operated. Further, competition regulations must be kept in mind throughout the design process so the final solution can form part of a fully rules-compliant competition car.

Successful completion of this project allows this year’s team to migrate to the newer 2022/23 chassis and progress towards our goal of having a rules-compliant autonomous Formula SAE car. The stakeholders involved include UTS Motorsports, UTS and team sponsors.

Suggested designs may involve a stepper motor-based design which connects near the base of the steering column. Alternatively, a modular quick disconnect-style design may incorporate an encoded DC motor near the top of the steering linkage, closer to the steering wheel. If need be, the existing steering linkage design may be modified so long as it does not compromise safety or efficiency.

**Deliverables:**

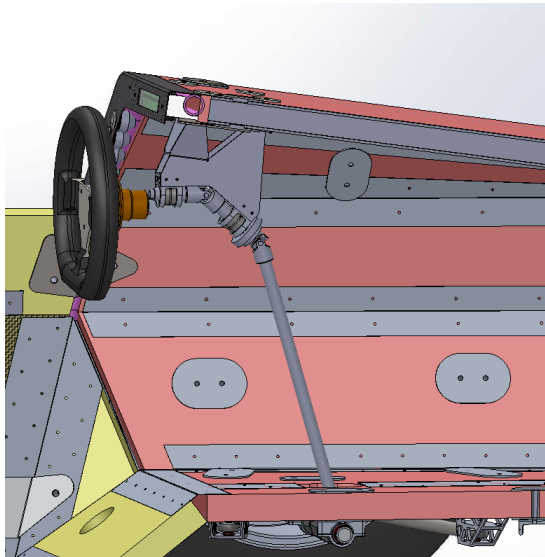
1. Steering solution – calculations, drawings and justifications all encapsulated in a detailed report.
2. CAD Model – Build upon the 2022/2023 CAD model to include the new steering actuation system.
3. Controller Package – should include a control unit that connects to a pre-existing CAN bus line (CAN2.0).
4. Physical Packaging – must consider the space constraints. Other systems such as a pedal box consume the footwell space and driver template.
5. Manufacturing – Once completed and approved, get the design manufactured.

**Additional Information and Resources:**

Figure 1 – CAD of existing steering mechanism in 2022/23 FSAE car

Learn more about the team here: [www.utsmotorsports.com](http://www.utsmotorsports.com)

2023 Autonomous steering demo: [http://youtu.be/UJp\\_kl\\_gaKE](http://youtu.be/UJp_kl_gaKE)



Skills required:	Not required at all	Might be required	Some experience required	Moderate experience required	Significant experience required
Mechanical engineering				X	
Mechatronic engineering				X	
Electronics			X		
Programming			X		
Hands-on manufacturing			X		
CAD (e.g. Solidworks)					X
Artistic design		X			

**Additional desirable skills/interests:**

Students should have some level of understanding in terms of vehicle dynamics (Ackerman steering) and know how to interface the controller or control unit to an existing controller area network (CAN bus 2.0). To best do this, it is recommended to use an STM32 (STM32CubeIDE) based platform paired with a motor controller (brushed DC, Stepper or BLDC). An off the shelf unit can be used so long as its justified and can interface with CAN bus.

For students who want to take this a step further, a custom controller [PCB] can be made and packaged tightly as space is a concern.

Ideally, this project is one where students can develop the foundational skills in autonomous systems or want to enter the automotive industry.