

## Meet the Team!

## **LHR Teams**



## Combustion

- Saturdays
- 10AM-5PM
- ETC Garage



## Solar

- Saturdays
- 10AM-5PM
- ETC Garage/J.J. Pickle
- Carpooling available



## Electric

- Sundays
- 10AM-7PM
- ETC Garage/J.J. Pickle
- Carpooling available

## Design team subsystems may have short weekly meetings on campus, outside of weekend workdays

## Committees

- Corporate Relations
- Events
- Outreach
- Facilities
- Public Relations
- Treasury







## **Organizational Overview**



Battery Protection System Lead



## **Competition Overview**

The Formula Sun Grand Prix is a track event, held on closed road courses. This unique style of competition truly tests the limits of solar cars in performance, strategy, and wheel-towheel racing.

The American Solar Challenge is solarpowered cross-country time/distance rally event. Teams compete over a 1,500 to 2,000mile course between multiple cities across the country.





## **LHRS – Power Generation**

## Led by: Andrew Yin









#### **System Overview**

Power Generation exists to harness solar energy so the car can charge, but it's not that simple! We produce our **solar panels** in-house starting with small cells. We also design the **embedded systems and software** infrastructure required to design and test the array and provide maximum **power to the battery**.

In Power Gen, you can gain experience in:

- Embedded Systems: Firmware (in C)
- Printed Circuit Board (PCB) Design & Testing
- Software Development (Python, JavaScript) for array testing infrastructure
- Solar Panel Soldering & Assembly

## LHRS – Power Systems

Led by: Frank Li



### **System Overview**

Power Systems is responsible for the design and manufacturing of the power distribution circuitry and the solar vehicle's two battery layouts: (1) the main pack, composed of lithiumion cells, and (2) the supplemental pack, composed of nickel-metal hydride cells. We are also heavily involved with designing PCBs for the car, which include PCBs for our embedded teams and PCBs that help with power management.

Consider Power Systems if you are interested in:

- Batteries
- High Voltage Systems
- Printed Circuit Board (PCB) design, soldering, and testing
- Embedded Systems software and hardware
- Electrical integration



## LHRS – Controls

## Led by: Diya Rajon



### **System Overview**

The **Controls System** is in charge of all driver interaction with the car. This includes internal and external lights, a display, and the motor control. If you'd like to gain some experience with embedded development, this system is for you!

#### If you're interested in:

- Embedded Development in C
- Low Latency User Interfaces
- GUI Design
- Regenerative Braking / Cruise Control

#### You will learn:

- C language
- Debugging hardware and software

## **LHRS – Battery Protection**

Led by: Lakshay Gupta



### **System Overview**

The **Battery Protection System (BPS)** monitors the car's battery pack to ensure the pack's voltage, temperature, and current are within safe ranges. We are responsible for designing and testing this safety-critical system.

On BPS, you will work on:

- Microcontroller Programming/Embedded Systems
- Open source Firmware and Hardware Development
- Real-Time Safety-Critical Software
- Designing for Testability & Robustness

Skills you will learn include:

- C Programming
- PCB Design & Soldering
- Hardware and Software Debugging

## LHRS – Data Acquisition

## Led by: Pablo Romero





#### **System Overview**

This is the system that receives all data transmitted from the solar car, including data about the car's speed, power consumption, and electrical systems. The long-term goal of is to develop hardware vehicle sensors, a mobile app to display vehicle data, and to utilize machine learning for race strategy

#### If you are interested in:

- App development
- Frontend Development
- Backend Development
- Embedded Hardware/Sensors
- Machine learning
- Race strategy in general

Consider applying to Data Acq!

## LHRS – Electromechanical

## Led by: Parthiv Shah





### Subsystems

0	Cooling	0	Enclosures	0	Wire Harnessing
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### **System Overview**

The Electromechanical System develops and manufactures solutions that integrate the electrical and mechanical divisions, working closely with all systems of the solar vehicle.

- **Cooling:** Manages the thermal regulation of the vehicle's components such as the battery system.
- Wire Harnessing: Designs and implements the electrical connections between the vehicle's systems.
- **Enclosures:** Develops protective housings, including the battery enclosure, to ensure durability and safety.

Ample opportunities are available for all engineering disciplines, but specifically for those interested in:

- Material Science
- Fluid Mechanics/CFD
- Heat Transfer
- Electrical/Mechatronics

## LHRS – Dynamics

## Led by: Harshit Dalmia





Vehicle dynamics is the study of cars in motion. We aim to optimize the efficiency of our vehicle through the design of our:

- Unsprung Designs brakes, wheels, hubs, and uprights and utilizes FEA to minimize weight.
- **Steering** Analyzes vehicle geometry to design for efficiency when turning.
- Suspension Optimizes vehicle handling to improve driver comfort and maintain tire contact across bumps and dips.

You will learn:

- SolidWorks part design
- Finite Element Analysis (FEA)
- Fusion 360 CAM
- CNC and manual machining





#### **Subsystems**

• Frame • Ergonomics

### **System Overview**

Body oversees the car's **structural chassis** and **each part the driver interacts with**. Our main goals are ensuring comfort, safety, and ease of interaction for the driver while making intersystem integration easy while minimizing weight

You'll learn...

- Computer Aided Design (SolidWorks)
- Finite Element Analysis (Ansys)
- **Manufacturing/Machining** (Lathe, Manual Mill, CNC, 3D printing)

LHI

- Welding
- Composite Manufacturing

## LHRS – Aeroshell

Led by: Jason Heston



#### **Subsystems**

Aerodynamics
 Composites

#### **System Overview**

The aeroshell deals with **designing** and **manufacturing** the exterior **composite shell** of the car. The shell must house and protect the car's interior while also maintaining an **aerodynamic design** for a more efficient ride! We also design the smaller **internal mechanisms** that piece the car together.

You'll learn...

- Composite manufacturing (the entire shell is hand-made!)
- CAD (SolidWorks)
- Different materials and tools
- Unique problem-solving skills

## LHRS – Operations

## Led by: Hardhik Sripuram



#### Subsystems

- o Corporate Relations
- o Public Relations
- o Treasury

#### **System Overview**

Members in the Operations team oversee the organization's growth and general marketing and business operations. They also design and order team merch and manage the social medias for the team.

#### Valuable skills you will gain:

- Professional communication
- Leadership skills
- Organization
- Graphic design
- Social media management/growth
- Network-building



## **ELECTRIC**

## **Electric Overview**



**Design** from the ground up

## Manufacture in house



Test to validation targets

## **Compete** in FSAE competition





## **Competition Overview**

Static Events



- Design
- **Business presentation**
- Cost Report Dynamic
- Acceleration
- Skidpad ٠
- Autocross ٠
  - Endurance

### Background

2016

**Electric Team founded** 2022 7<sup>th</sup> Overall in North America 2023 23<sup>rd</sup> Overall in North America 2024

8<sup>th</sup> Overall in Hybrid Class 42nd Overall in Electric Class

## Opportunity

**Opportunity to explore interests** 

Apply class content in the context of an innovative team environment

Experiences and real work that is applicable beyond college



## **Organizational Overview**





## LHRE – Operations

## Led by: Tracy Miranda







On the Road Again - Tuesday | FSAE Electric Michigan 2023 | LHR





## Subsystems

- Corporate Relations
  Sustainability
- Public Relations
  Treasury

## **System Overview**

Handles the business side of the team. Provide as many monetary and non-monetary resources to support our design team.

#### What we do:

- Form partnerships with companies
- Environmental impact reporting
- Resource tracking
- Green marketing
- Merchandise design
- Event and socials planning
- Social media marketing
- Videography, photography, video editing
- Vehicle livery design
- Balance account sheets

## All majors are welcome to apply!



## LHRE – Aerodynamics

## Led by: Conrad Wu







### Subsystems

Analysis
Structures

### **System Overview**

Aerodynamics provides downforce to increase the speed at which the car can take corners faster. This system designs the wings and, potentially, other aerodynamic devices like floors or sidepods. We manufacture these parts most typically with carbon fiber composites.

#### Responsibilities

- Aerodynamic design
- Carbon fiber and other composite material fabrication
- Billboard for sponsors

- ✓ External flow analysis with computational fluid dynamics (CFD)
- ✓ Composites manufacturing
- ✓ Structural analysis with finite element analysis (FEA)
- ✓ Model parts with computer aided design (CAD)





Fully painted and welded frame



Torsional rigidity frame simulation



Frame tacked



Bonding over fireproofing the firewall



#### In-House Welding

### **Subsystems**

Frame > Ergonomics

#### **System Overview**

The body system is the communicator that facilitates integration, packaging, and the optimization for driver performance. Members research, develop, and design the chassis, fixtures, and cockpit of the vehicle.

#### Responsibilities

Systems integration

•

- Driver comfort and driver packaging
- Structural design and analysis
- Adequate torsional stiffness

#### **Skills Gained**

- ✓ Computer Aided Design (CAD)
- ✓ Finite Element Analysis (FEA)
- ✓ Computer-Aided Manufacturing (CAM)
- ✓ General machining
- ✓ Welding
- ✓ Machine Shop Drawings (GD&T)

## LHRE – Dynamics Led by: Tyler Yan









### Subsystems

- Suspension
  Steering
- UnsprungBrakes

### **System Overview**

Vehicle dynamics is the study of the cars motion to optimize the handling and grip of the tires.

#### **Responsibilities:**

- High level vehicle geometry and stiffness characteristics
- Responsive and comfortable steering system
- Wheel assembly that connects the tires to the suspension and frame
- Hydraulic braking system responsive to driver input

- Vehicle dynamics analysis (kinematics, stiffness, stability and control)
- Mechanical design (CAD, FEA, solid mechanics, material selection, machine elements)
- Machining (manual and CNC mills, lathe, drawings)



## LHRE – Electronics

Led by: Matthew Mekha



Wya

I'm parked at 30.386080 N, 97.726631 W.



### **Subsystems**

Control Systems
Telemetry

Power Systems

## **System Overview**

The Electronics system designs the circuit boards and writes the software for the vehicle. We also handle off-car software like our telemetry server.

### **Responsibilities:**

- Vehicle controls (electric motor, cooling)
- Sensing (accel, GPS, voltages, temperatures, etc)
- Dashboard screen
- Telemetry server (database, backend, frontend)
- High voltage circuitry for battery control

- ✓ Printed circuit board (PCB) design
- ✓ Firmware engineering (C, C++)
- ✓ Software engineering (Python, SQL)
- ✓ Wireless connectivity (4G LTE, 5G)
- Apply industry standards (USB, CAN, IP67)

## LHRE – Powertrain

## Led by: Tessa Kasson and Andrew Simmons



## Subsystems

Battery > Thermals > Drivetrain
System Overview

Powertrain consists of the systems within the vehicle responsible for propulsion. It encompasses all components from internal energy storage to power application at the wheels and represents the electromechanical crossroad of the car.

### **Responsibilities:**

- Energy Storage (battery/accumulator modules, case, control unit)
- Power Transmission (HV chain, motor, inverter, transmission, drive shafts)
- Thermal Management (active battery, motor, inverter cooling)

- Detailed electro-mechanical design (power electronics, machine elements, heat transfer, CAD, FEA, CFD)
- ✓ Full-circle manufacturing (GD&T, CNC, lathe, welding, 3D printing, laser cutting)

## LHRE – Trackside Engineering

## Led by: Zaina Jafri









### Subsystems > N/A System Overview

Trackside Engineering's (TSE) supports the design team through testing and validation. TSE hosts Drive Days to train drivers and run tests. After Drive Days we analyze and validate any collected data.

#### **Responsibilities:**

- Drive Day Operations
- Test Development
- Hands On Vehicle Testing & Tuning
- Driver Selection & Training
- System Validation
- Operational Level Design
- Vehicle Characterization & Maintenance

- ✓ Test Engineering (Research, Design, Develop, & Execute Tests)
- ✓ Computer Aided Design (CAD)
- Software Engineering (Python, SQL)



## LHRE – Vehicle Modeling

## Led by: Robert Horvath



### **System Overview**

Vehicle Modeling (VMOD) performs high-level physics simulations to characterize the influence of design choices on vehicle performance.

#### **Responsibilities:**

- Racing line generation
- Steady state vehicle models
- Transient vehicle models
- Creating simulations from vehicle models
- Selecting system-level targets based on steady state response, transient response, and simulation metrics

- ✓ Computational engineering
- ✓ Software engineering (Python, C++)
- Classical mechanics (rigid body dynamics, fluid mechanics, heat transfer, solid mechanics, etc.)



## **Combustion Overview**









### **Competition Overview**

#### **Static Events**

- Business presentation
- Cost Report

### **Dynamic Events**

- Acceleration
- Skid-pad
- Autocross
- Endurance

## Background

#### 1981

Founded Formula SAE competition with Dr. Ron Matthews *Recent Performance:* **2023** 11th in Design (Tied) 46th Overall (114 teams)

#### 2024

11th in Design (again) 46th Overall (120 teams)

## What do we do?

- Mechanical Design
- Fluid Analysis
- Industry-standard manufacturing
- Computational simulation
- Embedded systems
- Engine development
- Endurance and Autocross racing
- Tomfoolery, buffoonery, clowning, and nonsense



## **Organizational Overview**





## LHRC – Simulation & Validation

Led by: Navya Agrawal



### **System Overview**

We handle the development of high-level tools for **vehicle and lap simulation**. We work **together** with most other design teams to model various vehicle systems, while writing code to simulate the relative performance impact of different vehicle designs and setups. Additionally, we handle the collection and **use of telemetry data**, to inform and **validate design decisions** and requirements.

#### **Relevant Skills:**

- ✓ Vehicle Dynamics
- ✓ Mathematical Modeling
- ✓ Computational Engineering
- ✓ MATLAB
- ✓ Python
- ✓ Data Acquisition

## LHRC – Body Led by: Ryan Gretta



### **System Overview**

We create all driver control surfaces and work closely with Dynamics and the drivers to design and simulate a car that is responsive and light. In addition, we create the basis for all other systems' mounting and placement

## Subsystems

- Frame Modeling, simulation, and fabrication of steel spaceframe
- Ergonomics Driver packaging, safety, and all driver interfaces
   Relevant Skills:
  - SOLIDWORKS mechanical design
  - ANSYS/SOLIDWORKS FEA
  - 3D printing
  - CNC and Manual machining
  - Welding
  - Material Validation

# LHRC – Aerodynamics

Led by: Arjun Bhatia



### Subsystems

Aero Design
 System Development
 & Validation

### **System Overview**

Develop aerodynamic devices to adjust handling characteristics, produce downforce, and maintain cooling requirements.

**Aero Design:** Use CFD and SolidWorks to develop an aero package. This includes wings, sidepods, undertray, nosecone, body panels

**System Development & Validation:** Use on-track data acquisition and experimental methods to validate and inform design decisions. Experiment with new simulation methods that streamline design and improve accuracy.

### **Relevant Skills:**

- SOLIDWORKS part-design
- CFD (ANSYS Fluent)
- Aerodynamics Testing
- Fluid Mechanics Knowledge
- Composites Manufacturing

## LHRC – Dynamics Led by: Edward Maddox





Suspension making Control Arms

Front Hub w/ brake rotor







2024 car with suspension mounted

### **System Overview**

Dynamics deals with all things relating to the **suspension**, handling characteristics, and wheel assemblies of the vehicle to generate maximum grip.

### Subsystems

Suspension - Optimizes vehicle handling through physics principles, and designs components to constrain suspension motion with the shock.
Unsprung - Designs CAD-heavy wheel components like the hub and upright and utilizes FEAs to minimize weight Brakes – Designs brake rotors with static/thermal simulation + race track data driven approach and specs brake calipers/hydraulic components

#### **Relevant skills:**

- Finite Element Analyis(FEA)
- Solidworks part-design
- CNC and manual machining
- Statics and Solids concepts
- Programming/Simulation









## LHRC – Powertrain

Led by: Ameya Dhumal











## **System Overview**

Powertrain is responsible for delivering power to the wheels of the car. We utilize various simulation and design tools to optimize the power output of the

### system

### Subsystems

- Engine Development Designs intake and exhaust package; increase power output of the engine; calibrate engine package
- Heat and Fluids Lubricates and cools the engine
- Drivetrain Responsible for delivering power from the engine to the wheels in the most efficient way

#### Relevant Skills you can learn:

- SolidWorks mechanical design
- FEA
- CFD
- 1D Engine Simulation
- Engine Tuning and Dyno operation

# LHRC – Electronics

### Led by: Ryan Flick











### Subsystems

• Hardware • Software

### **System Overview**

### **Responsibilities**:

- Wire and power the car
- Manage and help configure the ECU
- Develop tools to help team and driver
- Procure and provide telemetry data to the team

### Hardware

#### **Responsibilities**:

- PCB Design, Assembly, and Test
- Electronic Component Enclosure Design
- Wire Harnessing Design
   and Manufacturing

#### What You'll Work On:

- Power Distribution
- Telemetry Modules
- Dashboard Display
- Paddle Shifters

## Software

#### **Responsibilities**:

- Data acquisition, processing, and visualization
- Embedded programming in the STM32 ARM architecture

#### What You'll Learn:

- Languages: C, C++, Python
- **Technologies**: AWS, Git, Docker, Kubernetes, React
- Skills: Networking, Embedded Systems, Full Stack

## LHRC – Composites

Led by: Clayton Christy















### Subsystems

- o Design and Analysis
- o Manufacturing

### **System Overview**

- What we do:
  - Design, research, validation, and manufacturing of composite parts (Carbon Fiber and Kevlar)
- Parts We Make:
  - Bodywork, Front wing, Rear wing, Undertray, Control Arms, Side Pods, etc.
- Our Goals
  - Reduce weight by converting parts into composites materials
  - Assist other subsystems in increasing their usage of composites.

### Full Engineering Experience, One System

Design, digital analysis, physical validation, industry level prototype manufacturing, innovation, weight optimization, Integration, cost analysis.

### WE TEACH EVERYTHING!



## LHRC – Operations

Led by: Sahith Mocharla









# Subsystems• Treasury• Corporate Relations• Public Relations

### **System Overview**

Operations is the infrastructure of the team. Anything non-engineering, be it finances, PR, volunteering, general coordination, are all the responsibility of operations. The system is a great way to get practical experience in business (specifically finance) and communication related careers.

### All majors encouraged to apply (including engineers). Hours can differ from rest of organization.

What You'll Get:

- Real experience in your chosen position
- Instant organizational impact
- Company exposure



## How to Apply

## LONGHORN RACING RECRUITING 2024



LHR=

## **Our Recruitment Process**

## 1) Applications

- a) Save your application seperatl!
- b) Resume + Portfolio must be in link form (ex: google drive, website, etc)

--> Make sure sharing access is correct: "Anyone with link can view"

--> We will not be able to view your resume otherwise

- 2) Interviews: Sep. 9-13
  - a) Decisions will be released Sep 18th @ 5pm
- 3) Trial Workdays: Sep. 21-22
  - a) Solar Saturday, September 9th (10am-1pm)
  - b) Combustion Saturday, September 10th (2pm-5pm)
  - c) Electric Sunday, September 10th (10am-1pm)

## 4) Offers

- a) Decisions will be released Sep. 25 @ 5pm
- b) Accept/Reject Offer by Midnight same day

# What are we looking for?

## 1) We are open to all majors!

1) We do not require ANY prior experience!

2) Passion

- 3) Willingness to learn
- 4) Double check that your resume is shared with all
  - 1) If not your application will not be considered



## **Frequently Asked Questions**

### • Who gets to drive?

- Dedicated members of the team that are skilled drivers will have the opportunity.
- Which team should I join?
  - Whatever system/cars/teams interest you!
  - Look at what works best with your schedule.
- How much of a time commitment is LHR?
  - Mandatory Workdays + Weekly system meetings.
  - Time outside may be encouraged based on system/team.
- Can I apply if I'm not an Engineering major?
  - o Yes!
- Do I need any prior experience?
  - **NOPE!!!!**

- What can I do to boost my chances?
  - Don't be afraid to ask questions.
  - Be yourself!
  - Don't pester leads about joining (ask your questions at scheduled LHR events)
- What does LHR look for in a resume?
  - Mindset working in group projects
  - Time management
  - Curiosity and dedication
- Can I be on more than one team?
  - o Nope

## **Open House!**



## **Apply Here!**



2024 Fall Application Portal



# Thank you!

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