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## University of Washington EcoCAR 3 Team Application Form

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## What is EcoCAR 3?

Sponsored by the U.S. Department of Energy (DOE) and General Motors, EcoCAR 3 is a unique four-year collegiate engineering competition. The competition's mission is a vital one: offer an unparalleled hands-on, real-world experience to educate the next generation of automotive engineers through innovative design. The competition challenges 16 universities across North America to reduce the environmental impact of a 2016 Chevrolet Camaro without compromising performance, safety and consumer acceptability. Over four years, the donated vehicle is redesigned and validated in CAD, before being completely disassembled to implement new powertrain, centerstack, control, and suspension components. All the while, vehicle programming is overhauled to compensate for new control modules and validated using hardware simulation to reach a 99 percent vehicle buy-off rate.

## How does it work at the UW?

This team is almost entirely student run, which means that the students are mostly responsible for the design, manufacturing, and testing process – a massive technical and administrative feat. Our faculty advisors and external industry advisors are valuable resources in providing direction and guidance for our research and development, but the team’s success is really driven by the EcoCAR 3 student members. Alongside engineering members, business and communication teammates maintain sponsor and media relations, manage finances, and sustain vital lines of communication to keep the project running smoothly.

## Is UW EcoCAR 3 the right fit for me?

The team is seeking students with a strong initiative and work ethic who will to follow through with the project for one, two, or even three years. We are looking for students from all engineering disciplines as well as business and communications, though the team will be primarily composed of mechanical and electrical engineering majors. The team is run like a business, so there are distinct technical and administrative wings within the team. With a broad spectrum of projects, there is a place for every interest. While some focus on administrative and financial projects, others will have specific technical knowledge essential to the design of the car.

It is also extremely important to acknowledge that this team is entirely reliant on the participation of students. This means that the responsibilities given to each student are critical to the team’s success and cannot be overlooked. Joining is a very large commitment throughout the entire year and often provides a challenge in balancing other coursework. While individual experiences will vary, students can expect to commit at least ten hours per week. Many spend additional hours as they become more involved and excited about the project. It is highly likely, however, that students will find these hours to be some of the most valuable in their undergraduate careers.

## Technical Teams

Junior and senior members of a Technical Team must either have completed their basic engineering coursework or demonstrated a particular knowledge in an area critical to one of the following groups. We are also looking for interested freshmen and sophomores who want to develop technical knowledge and experience in a hands-on environment.

### Mechanical Group

The mechanical group will be responsible for designing and machining structural components, performing packaging analyses, modeling overall vehicle dynamics, and full car simulations. Special skills that a mechanical group member will develop include:

* Performing finite element analysis of powertrain mounting, suspension linkages, etc.
* Performing thermodynamic and flow analysis for components
* Performing vibration isolation analysis and implementation
* Designing for consumer acceptability in addition to functionality
* Proficiency in Solidworks and NX 7.5 CAD Softwares
* Additional topics including aerodynamics, chassis dynamics, packaging studies, greenhouse gas emissions research using GREET, and more

### Electrical Group

The electrical group will be responsible for the design and specification of power electronics, including batteries, motors, controllers, and wiring. Special skills that an electrical group member will develop include:

* Utilizing basic circuit theory to design and debug low voltage circuits and housings
* Bench testing components to ensure reliability before vehicle integration
* Performing high voltage system design and documentation
* Specification and selection of high power electric motors
* Learning about and implementing automotive grade wiring practices
* Proficiency in Multisim, Simscape, Controls Desk NG, and Schematic Software's such as SolidWorks Electrical.
* Additional topics including EMI shielding techniques, automotive communication networks, embedded systems design, system analysis and exercising electrical lab safety techniques.

### Controls Group

The controls group will be responsible for designing the control scheme used by the vehicle to meet driver and vehicle demands. Previous experience with Simulink or a programing language is beneficial but definitely not required. Heavy emphasis by the controls group on hardware-in the-loop (HIL) and software-in the-loop testing will ensure a successful vehicle design. Special skills that a controls group member will develop include:

* Running systems level performance analysis using Autonomie
* Developing rapid control prototyping practices using SIL and HIL tools
* Designing fault tolerant control systems
* Proficiency in Matlab, Simulink, Controls Desk NG
* Additional topics including control system development, calibration, refining and validation of the control systems

### Modeling and Simulation Group

The Modeling and Simulation group focuses on developing a software model of the car to be built. This will help the controls group to run hardware-in the-loop (HIL) and software-in the-loop (SIL) tests and validate control algorithms before being implemented on the vehicle. Special skills that a M&S group member will develop include:

* Vehicle architecture studies using Autonomie
* Proficiency in Matlab, Simulink, Controls Desk NG, and Automation Desk
* Interfacing with HIL simulator and pre-built 12 V networks
* Additional topics include dSPACE library block, CAN communication, and communications network design

## Why should I join the team?

In the engineering realm, hands-on experience is extremely important. As a member of UW’s EcoCAR 3 team, you will bring concept to reality by designing, building, and testing a production-ready plug-in hybrid electric vehicle. Students in the program will obtain a skillset well beyond what is available from traditional engineering curriculum. Besides being well-versed in automotive engineering and many industry-level engineering software packages, EcoCAR 3 members will practice decoupled engineering development as part of a multi-disciplinary team that brings a product from ideas and simulation to a fully developed, production-ready prototype.

In addition to the valuable experience gained by participating as a UW EcoCAR 3 team member, students may qualify for “Special Projects” credits through their respective departments. For some departments, students may also use the team as a mechanism for earning their senior capstone credits.

## How Do I Become a Member?

1. Read through the team description above and decide on a team that interests you
2. Submit the following items electronically to [uwecocar3@gmail.com](mailto:uwecocar3@gmail.com)
   1. The application on the following page filled out.
   2. Unofficial transcript in PDF form
   3. Resume complete with relevant coursework and experiences you feel would make you a successful member of this team
   4. Cover letter addressing the following topic: **“Why I want to be part of the UW EcoCAR 3 team and what makes me a good fit”**

Upon receipt of your materials, you will receive a response within 5-7 day. Interviews are first come, first serve, so please submit your application as soon as possible. Your interview should last no longer than 30 minutes and will be conducted by the leader of the group you find interest in. Final selection approval will be pending on the faculty advisors.

We look forward to interviewing you as a potential member of the UW EcoCAR 3 team!**Application – To Be Retained by UW EcoCAR 3**

(Please complete the following fields)

Name:

Email:

Phone:

Student Number:

Current Class Standing (Freshman, Sophomore…):

Major or Predicted Major:

GPA:

Expected Graduation Date (Quarter/Year):

Group Interest (Primary):

Group Interest (Alternate):