

## EE 499 Winter 2021 Proposal – 3 Credits

### *CAN Network Analysis & Validation*

I hope to continue my research on the University of Washington EcoCAR's twelve-volt power distribution system by analyzing and validating both the modified GM-Stock and team-added CAN networks that currently lie untested within the vehicle. At present, only three of the six planned team-added CAN Busses have been wired with just one CAN network tested for continuity. Additionally, some of the CAN networks that the low voltage team has wired were made in haste and tend to have longer stub lengths than recommended for a 500-kbps network. Although this is partially due to the work limitations of the COVID-19 pandemic, the team currently lacks the knowledge and training resources to physically test and validate these networks. Therefore, the project that I am proposing will include creating a repeatable test procedure to validate the effectiveness of these CAN networks within the Blazer as well as an in-depth training module to increase overall knowledge of CAN on the team.

In terms of specifics, I plan on first researching CAN "physical layer" validation, which details the process of probing CAN wires with oscilloscopes or interface tools to achieve desired baud rates and prevent aliasing. This will require me to look over many CAN documents to find the best possible procedure or script to physically implement. I then plan on using an oscilloscope or interface tool to analyze the quality of signals. Next, I will possibly try my hand at sending CAN signals across the busses, working with the PCM swimlane to gain an understanding of how CAN messages are encoded. In this phase, I am thinking of possibly creating a CAN interface tool that would display CAN signals on a small screen via an Arduino to have a permanent testing tool that EcoCAR can use far into the future. Finally, I will write a step-by-step procedure on how to use the aforementioned tools to test, validate, and debug CAN networks such that anyone in EcoCAR can understand after I graduate this year.

Furthermore, I would potentially like to write a complete CAN training module for the team. The current team-provided module only covers a basic level of understanding and is made up of ten or so unorganized documents that overlap and are inconsistent with one another. I would therefore like to consolidate all these trainings into one editable, easy to use CAN training document. I also plan on making an in-depth version as well as a simplified version since most team members should have a general idea of CAN while low voltage team members should have a more thorough understanding.

In addition to submitting my report, I plan to deliver the results of my research which will most likely include my CAN network validation procedure, CAN training module, analysis/simulation results, recommendations for CAN network changes, and possibly some electrical schematics or source code. In this research, I hope to improve this sector of EcoCAR and make it easier for others to test and validate as we enter the last two years of the competition.