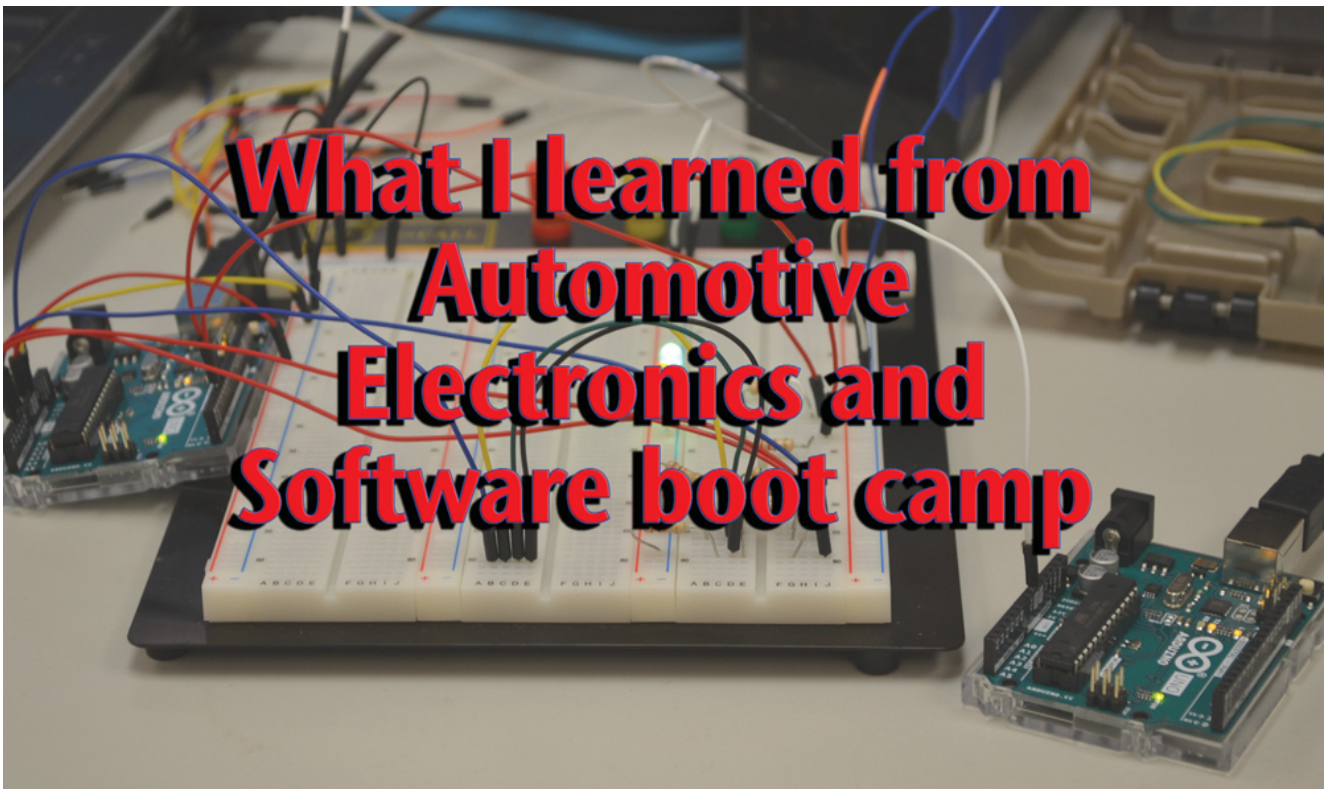

By Tim Iezzi, Owner Iezzi's Auto Service, Reading, PA


Tim Iezzi

From September 16th to September 20th, 2019, MACS was pleased to host the Automotive Electronics and Software boot camp presented by Dr Mark Quarto of Future Tech Automotive. There were 17 students who attended this fastpaced and hands-on class representing all segments of the industry, including service technicians, educators, and engineers both heavy duty and light duty, from all over the U.S. as well as Canada.

The course began with the basics of Ohms law, resistive circuits and the calculation of power used by components. This first section serves as an introduction for the less experienced students and a refresher for the more experienced students, ensuring that everyone possesses the foundation of knowledge needed to proceed on to more complex electronics.

The course moves on from basic circuits into solid state electronics, such as diodes and transistors. We explored how different types of these components worked and covered where each would be used in automotive systems. Dr Quarto keeps lecturing to a minimum, preferring to teach theory through practice. Much of the time in class is spent building circuits that mimic those we would find on cars. Tasks include controlling a compressor relay and regulating the speed of a blower motor by controlling a field effect

compressor relay and regulating the speed of a blower motor by controlling a field effect transistor. We then used meters and oscilloscopes to analyze how the circuit functioned. Skills learned here can be taken directly back to the shop and applied to testing our customers' cars.

The class moved from discrete components driven by analog voltages to controlling circuits with a microprocessor. Dr Quarto uses the Arduino family of microcontroller, which every student gets to keep after the course is over. Arduino controllers, which accept both analog and digital inputs, are capable of producing analog and digital outputs, just as a controller does. Many of the same circuits were built to be analyzed, but instead of controlling with potentiometers and switches, are controlled with the Arduino. We supplied the Arduino with inputs, such as A/C request and blower speed request, and asked the Arduino to drive a transistor to spin a motor based on inputs. Sounds familiar, right? This project not only involved building circuits but writing the code to control the circuit as well, subsequently outputting the values of the inputs to the computer screen as a scan tool does. This gave the students a deep understanding of what is going on inside the modules we are working with on the car.

The course concludes with a final design project. Students are asked to design a circuit to control a compressor relay based on inputs from a an A/C pressure sensor to the Arduino, output the relay status and fuel pressure to a screen (scan tool) and illuminate a malfunction indicator light if the pressure is out of range high or low. The