# CAN/J1939 Course Project Setup Requirements

**Objective:** The objective of document is to provide an outline and discussion for a project following the completion of the courses from the DISTek U Tech Track – Network Communications, including:

* [CAN Basics Training A Practical Introduction to the CAN Bus](https://kvaser.com/course/can-basics-training-a-practical-introduction-to-the-can-bus/)
* [Introduction to J1939 (EN) – Learning Module J1939](https://elearning.vector.com/mod/page/view.php?id=406)
* [SAE J1939 Introduction](https://kvaser.com/about-can/higher-layer-protocols/j1939-introduction/)
* [The CAN Bus Protocol Tutorial](https://kvaser.com/can-protocol-tutorial/)

**Requirements**

* After taking these courses, one should be able to demonstrate an understanding of the following.
  + Understand standard J1939 Message Format (Single 29-Bit Packet)
  + Understand DTC Codes and general workings of DM1/DM2
  + Basic understanding of J1939 Transport Protocol
  + Understanding of a DBC file and how to translate data from a J1939 message into usable data.

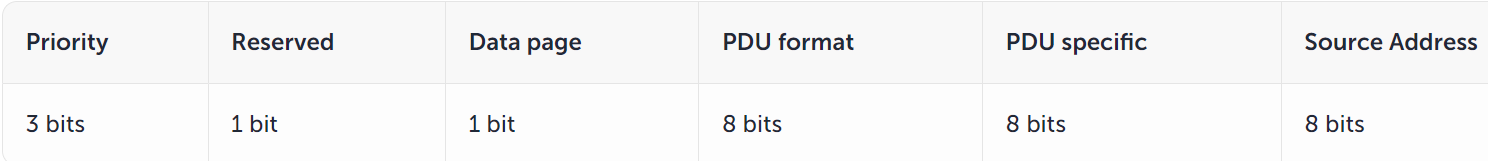
**Project**

**Overview:** The end goal and purpose of this project is to allow anyone who takes the CAN/J1939 courses to demonstrate an understanding of the above requirements using hardware and a physical CAN bus. This would add the most benefit to actually understanding the material and using it opposed to trying to remember material from these courses.

**Hardware**

* This project will consist of 2 breakout boards used for development. They will be hard wired together using SPI communication from the microcontroller board to the CAN breakout board.
* The CAN breakout board will be wired to a CAN banana jack box, as will the PCAN/USB adapter, and the intent is that whoever uses this device later will have a CAN box and PCAN/USB adapter to use.
  + CAN Banana Jack Box or some method of connecting wires
  + STM32L432KC Microcontroller Breakout Board (NUCLEO- L432KC)
  + MIKROE-988 Board CAN-SPI CLICK 5V MIKROBUS
  + PCAN Adapter

**Software Development**

* The intent for the software development portion of this project is to use the STM32Cube IDE for development. This will make the process of setting up pinouts and other hardware specs much easier, using the gui for STM32. Drivers will need to be written for the SPI interface so that CAN communication can happen. Sample application will also need to be developed and will include a table of hardcoded PGNs and responses that the user can send messages too and expect responses, as well as DTCs.
  + Kvaser DBC
  + PCAN or CANKing
  + STM32Cube IDE
* The user will need to create a DBC file for testing to show an understanding of how messages are broken up. There will be a separate document that defines the 29-bit identifiers. The user will need to create these messages in PCAN or other tool and send them to the controller.
  + Includes 2 CAN identifiers
    - PGN defined for each of these, making sure to follow
  + Includes 4 SPNs within the data section for each CAN message
    - Data for the messages will be defined including the data type(signed, unsigned, etc.), byte order type (Intel/Motorola), starting bit position, length, scaling factor, offset, and min/max values.
* The user will need the SAE J1939 test project controller that will be included in the project packet. This project will be capable of sending/receiving single packet and transport protocol messages to simulate CAN traffic, as well as handling DTCs.
* It will be up to the user to create the PCAN file and format/send messages correctly, while monitoring the CAN bus for incoming data.
  + The project will be set up to receive specific CAN data and it will reply on both CAN and serial to indicate that the CAN data from the user was sent correctly.
  + Dm1/Dm2 will operate in much the same way as standard CAN data. The user will need to send data for both of these and the serial output will print out the SPN/FMI of the DTC, letting the user know it was sent correctly.