1. [10 points] In this experiment, you will be demonstrating that your Pt-51 kit works by running the test code for the kit. The test code also checks the peripherals on the kit. By completing this test, you can also verify that the required software is correctly installed. **There is no code upload for this experiment. Evaluation will be done by TA during viva.**

   - Know more about the Pt-51 kit by going though these slides: `https://ee337.github.io/pt51.html#user-manual`

   - Install FLIP (on Windows) or DFU Programmer (on Linux/Mac). This software is used to load programs into the 8051 microcontroller on the Pt-51 kit. The steps are here: `https://ee337.github.io/tools.html#flip`

   - The procedure to load a hex file onto the Pt-51 kit using Flip is shown in the video at the following URL.
     `https://ee337.github.io/pt51.html#programming-and-testing`
     Follow the procedure and load the `led.hex` file to see that the LEDs on your kit toggle.

   - Download the file `pt51_test.hex` and load it on your Pt-51 kit, as described at the following URL.
     `https://ee337.github.io/pt51.html#testing-the-peripherals-of-pt-51`

   - Follow the steps in the slide deck titled "Pt-51 Test Program" to do the self-test of the kit. Check if all tests run successfully. If there are failed tests, inform us on Moodle/Teams. Also inform the TA during the viva session.

2. [10 points] In this experiment, you will write code to read and write values to Port 1 which is abbreviated as `P1`. Read the lower nibble (4 bits) of `P1` to get the delay D and perform the following task.

   - Toggle the port pin `P1.7` repeatedly with an inter-toggle delay of $2D$ seconds.
   - Toggle the port pin `P1.6` repeatedly with an inter-toggle delay of D seconds.
   - Toggle the port pin `P1.5` repeatedly with an inter-toggle delay of $\frac{D}{2}$ seconds.
   - Toggle the port pin `P1.4` repeatedly with an inter-toggle delay of $\frac{D}{4}$ seconds.

   The minimum value of D can be 1 second. As an example, if D is 4, then `P1.7` should toggle with a 4 second inter-toggle delay. The port `P1.6` should toggle with a 2 second inter-toggle delay and `P1.5` should toggle with a 1 second inter-toggle delay. Verify the toggling period in each port pin using the logic analyser in Keil.

TA Checkpoints

1. For question 1, ask the student to demonstrate the procedure of loading `led.hex` file onto the Pt-51 kit. Ask the student to demonstrate the toggling of LEDs on the board.

2. For question 2, ask the student to load the value `8` into the lower nibble of `P1` and show the toggling waveform of the four pins (mentioned above) in Keil's logic analyser.