

## OpenEngineering Lab Sampling and Fourier Experiment

This session uses apparatus that can be found/booked at <https://learn5.open.ac.uk/>

Login with your credentials.

Search for (top right of page): **T212**

Select: **Fourier (T212)**

Now click on 'Fourier booking'. Finally, click on 'Book this slot' in the first available time slot shown.

This will connect you to the Fourier apparatus that looks like the image shown in Fig. 1 (a). This apparatus can be used for investigations into sampling of signals and the associated Fourier spectrums of signals created by passing infrared light through the slots in a disc. In this brief demonstration task you will explore the motor speed and frequency spectrum generated by the experiment.

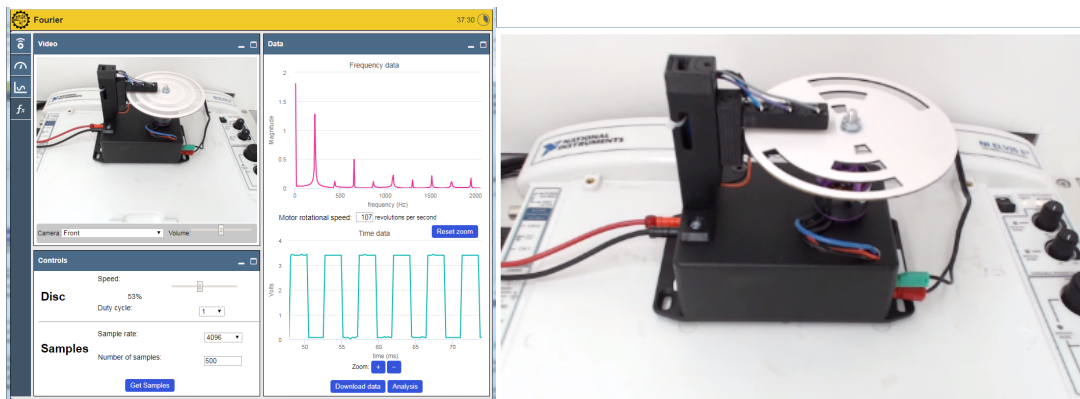


Fig. 1. (a) Fourier activity user interface and (b) equipment

The equipment used in this session is shown in Fig 1 (b), consists of a disc with arc-shaped slots cut out. The centre of the disc is attached to the vertical shaft of a motor that spins it in a circular horizontal motion. Above the disc are three photodiodes set in a cantilevered arm and below the disc are three permanently illuminated infrared LEDs. When the disc spins, the light from the LEDs either is blocked by the disc or passes through the slots.

### Task

- In the **Controls** panel, move the **Speed** slider to 20%. You should hear the motor start with a low-pitched whine and the slots will disappear in a blur as the slotted disc rotates.
- Take samples of the voltage for the outermost slots on the disc (duty cycle 1). Leave all settings on their default values and click on the **Get Samples** button.
- Review the results in the **Data** screen, you should be able to see the frequency data in the top screen and the time series data in the bottom screen.
- Calculate the motor speed by measuring the distance between two points one complete cycle apart on the time data graph.
- Explore the **Speed**, **Sample Rate** and **Number of Samples** controls to investigate the effect of each control.

