Experiment No.1: Project-Based Learning Activity 1: Introduction to Instruments & Equipment – Learn by Doing

Objective:	To introduce students to essential electronic and prototyping laboratory instruments through hands-on, task-oriented experiences that involve observation, demonstration, replication, and reflection. The activity aims to develop foundational skills in the safe, correct, and meaningful use of equipment such as the multi-meter, cathode ray oscilloscope, power supply, function generator, and 3D printer.
Outcome:	☐ **Demonstrate Measurement Proficiency Using a Multi-meter** – Accurately measure DC voltage across terminals, check resistor values using color codes and direct measurement, and test circuit continuity. – Populate observation tables with measured values and reflect on possible deviations from expected values. ☐ **Operate and Interpret Readings on a Cathode Ray Oscilloscope (CRO)** – Display and interpret waveforms (sine/square) in terms of amplitude, frequency, and time period. – Identify common settings such as volts/div, time/div, and triggering. – Compare signal behavior across different channels. ☐ **Understand and Use a DC Power Supply** – Set and verify output voltage and current limits. – Use a multi-meter to validate the output parameters. – Interpret meaning of current limit setting. ☐ **Generate and Analyze Signals Using a Function Generator** – Generate basic waveforms (sine, square) and vary their amplitude and frequency. – Observe and correlate the output on a CRO, identifying waveform properties and anomalies. ☐ **Perform Basic 3D Printing Workflow** – Understand the role of .stl and .gcode file formats in 3D printing. – Convert a given .stl object to .gcode using slicer software. – Initiate a basic print on a 3D printer and monitor the print quality
Tasks Problem Statement, Procedure, Observation, Discussion, and Report	1) **Use of Multimeter:** *Voltage Measurement:* Refer to this introductory video, Lab_Experiment_One_Activity_1 / Lab instructions, and complete the observation table below: _see table below_ *Please ensure that voltage measurement is not done at dial setting 200m V Answer the following questions:

S No.	Battery Type	MM Dial Setting 2V	MM Dial Setting 20V	MM Dial Setting 200V
1.	AA			
2.	NiMH			
3.	18650			

	What is the reason for difference in readings for the same battery voltage for different dial settings of the multimeter. What distinguishes the cells from each other and the reason for the same. *Resistance Measurement:* Refer to this introductory video, Lab_Experiment_One_Activity_2 following which complete the observation table below: <table><tr><td>Sr. No.</td><td>Resistor Color Codes</td><td>Resistance value Calculated</td><td>Resistance value using Multimeter</td></tr><tr><td>1</td><td></td><td></td><td></td></tr><tr><td>2</td><td></td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td></tr><tr><td>4</td><td></td><td></td><td></td></tr><tr><td>5</td><td></td><td></td><td></td></tr></table> 2) **Cathode Ray Oscilloscope:** Lab_Experiment_One_Activity_3 With regards to the test waveform displayed on the CRO, complete the observations in the table below: <table><tr><td>Waveform Square</td><td></td><td></td><td></td></tr><tr><td>Amplitude measurement</td><td>No. of divisions =</td><td>Dial Setting volt / div =</td><td>Peak to Peak voltage =</td></tr><tr><td>Frequency Measurement</td><td>No. of divisions =</td><td>Dial setting time / div =</td><td>Frequency =</td></tr></table> 3) **Function Generator:** Lab_Experiemnt_One_Activity_4 Verify the wave type, frequency and amplitude generated using CRO: <table><tr><td>Waveform Type</td><td>Amplitude</td><td>Frequency</td></tr><tr><td></td><td></td><td></td></tr></table> 4) **Laboratory Power Supply**: (Faculty mentor-initiated activity) Facutly mentors orient the learners and explain the specifications and range of the dc power supply on their work bench. Learners use a multimeter to verify the dc voltage generated by the supply. 5) **3D Printing:** (to be conducted later)
Conclusions:	