

Experiment 6: Diode Characteristics and Applications

Arnav Kapoor

18th September 2025

1 Aim

To study the I-V characteristics of a diode and its applications in rectifiers, clippers, and clampers.

2 Apparatus

Diodes, resistors, function generator, oscilloscope, breadboard, connecting wires, LTspice software.

3 Theory

4 Experimental Setup

Below are the experimental setup images:

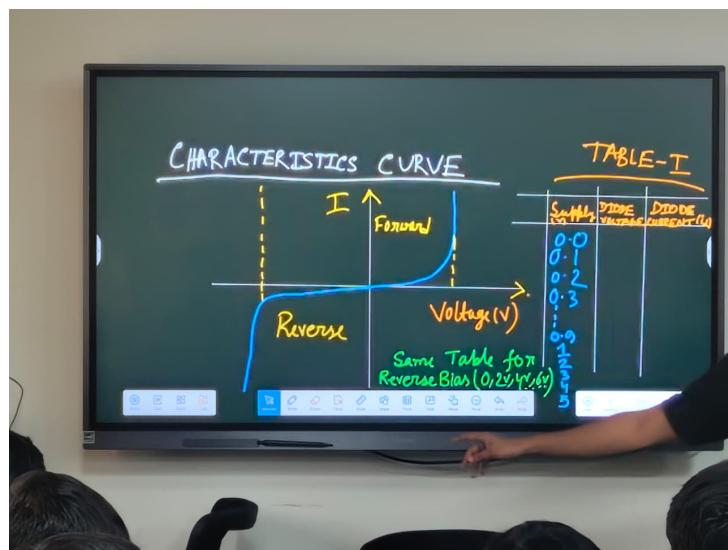


Figure 1: Experimental setup 1

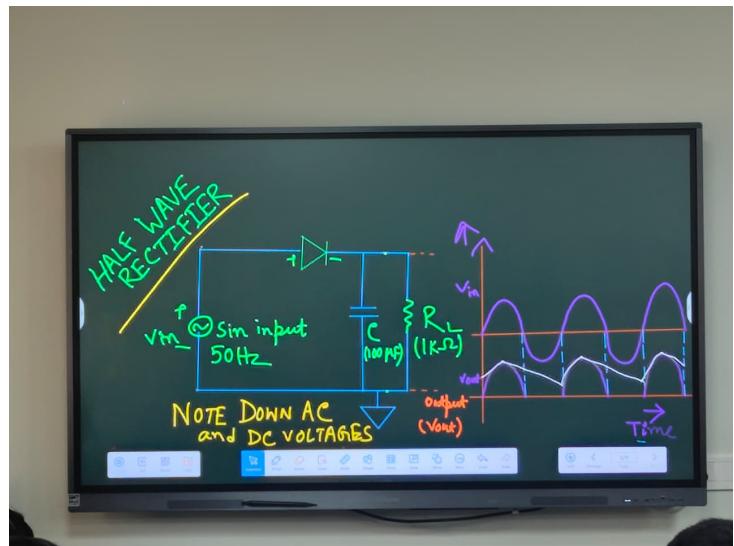


Figure 2: Experimental setup 2

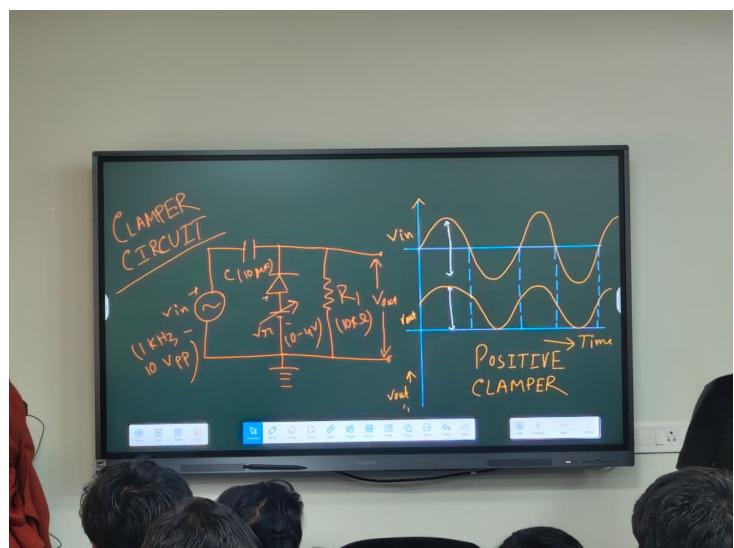


Figure 3: Experimental setup 3

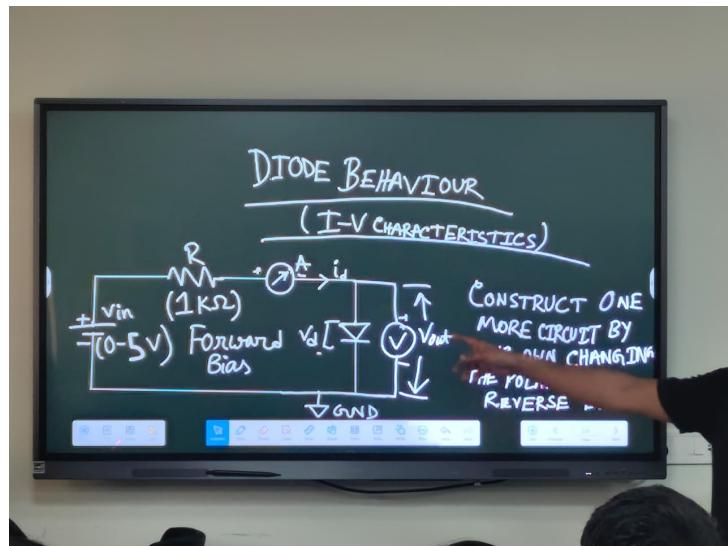


Figure 4: Experimental setup 4

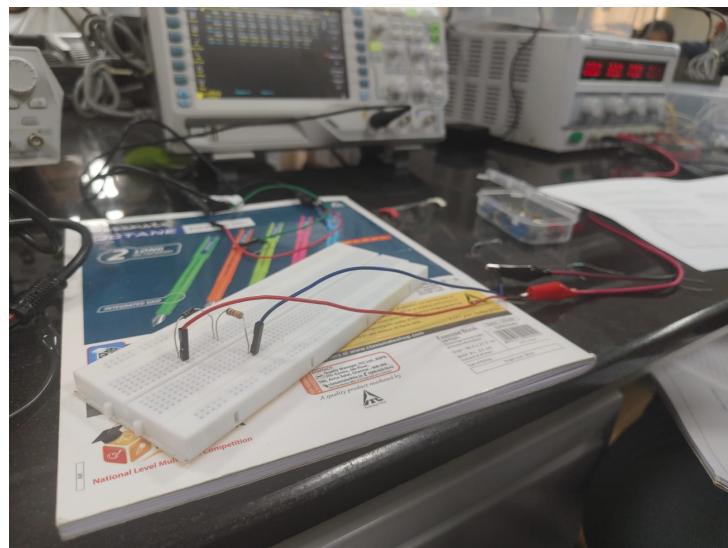


Figure 5: Experimental setup 5

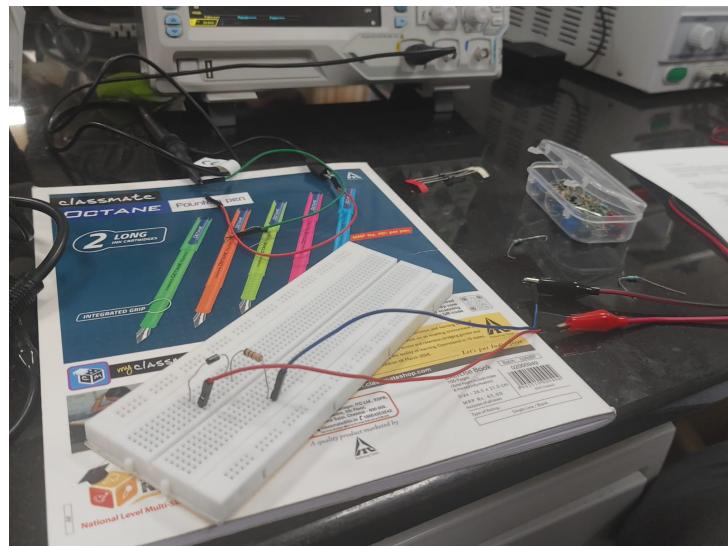


Figure 6: Experimental setup 6

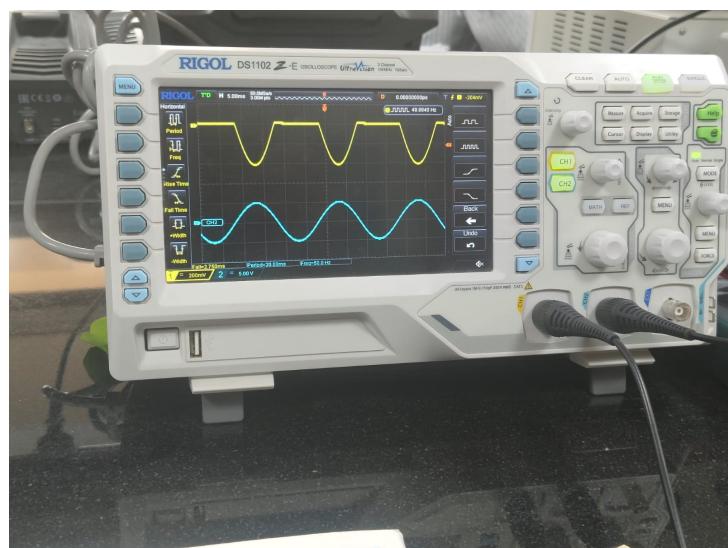


Figure 7: Experimental setup 7

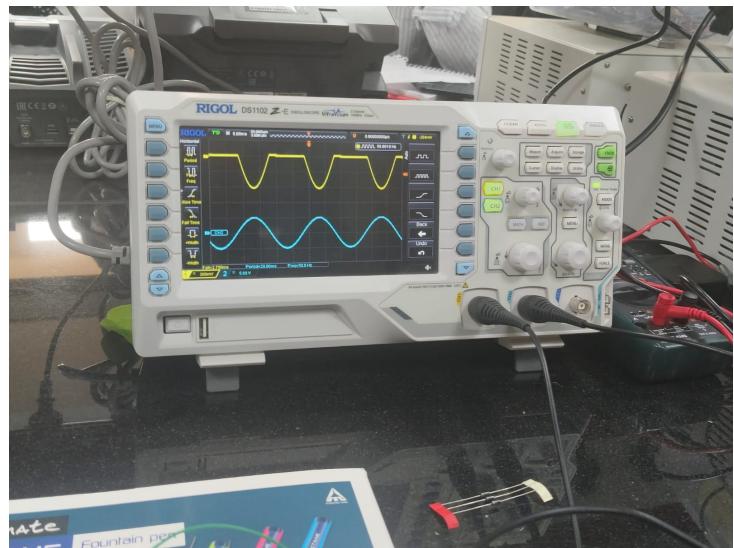


Figure 8: Experimental setup 8

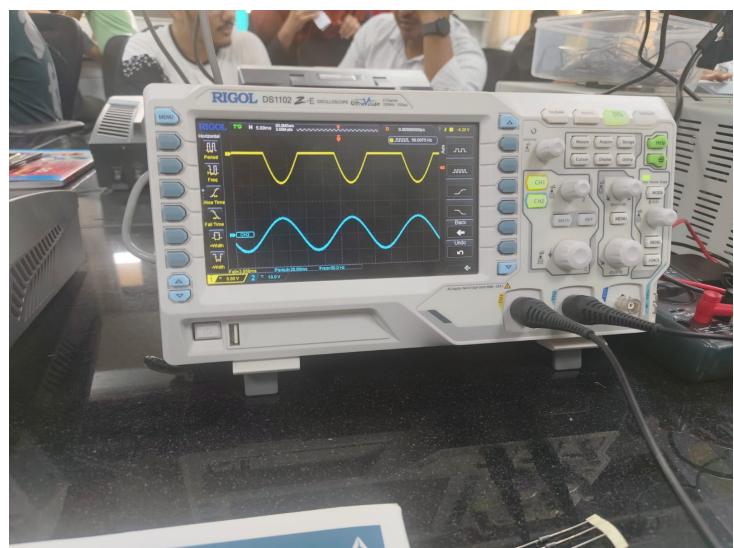


Figure 9: Experimental setup 9

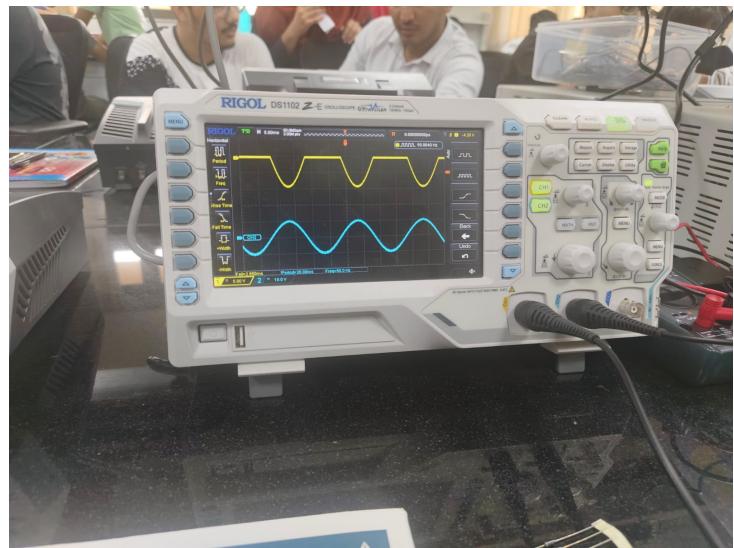


Figure 10: Experimental setup 10

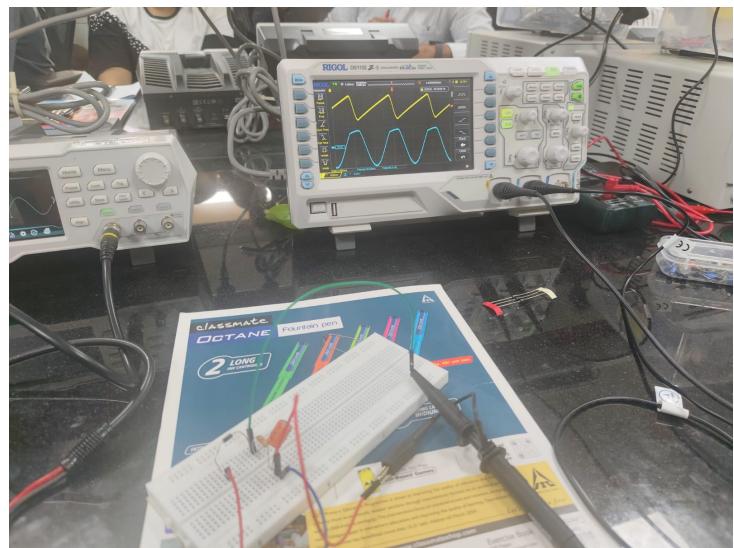


Figure 11: Experimental setup 11

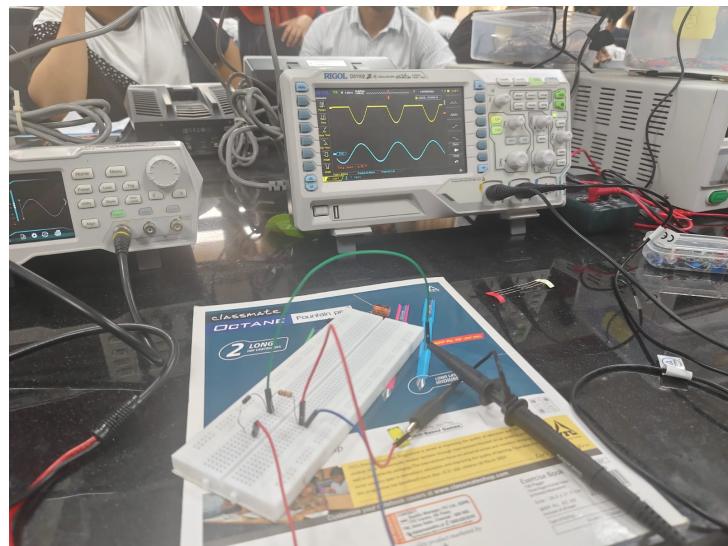


Figure 12: Experimental setup 12

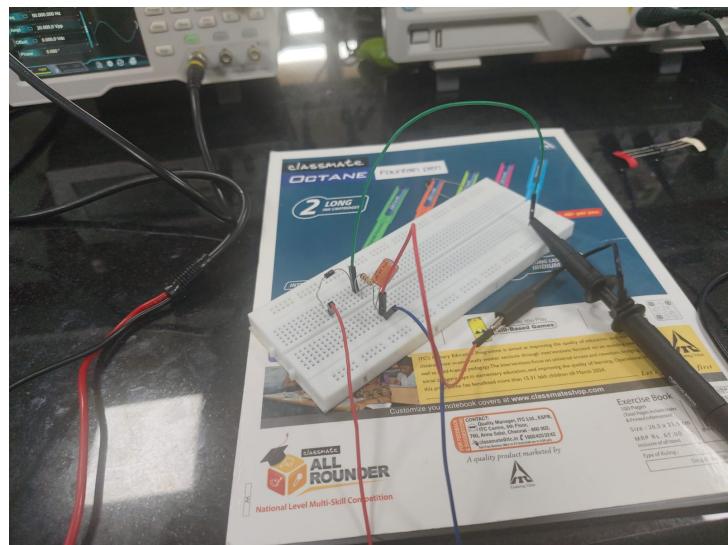


Figure 13: Experimental setup 13

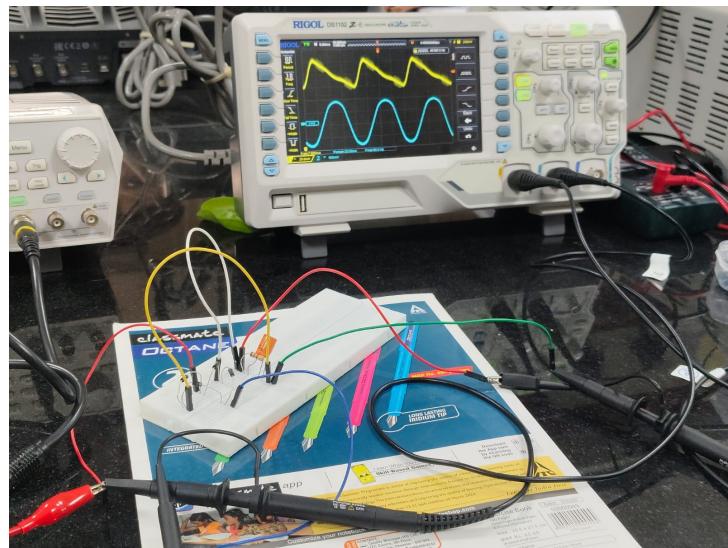


Figure 14: Experimental setup 14



Figure 15: Experimental setup 15

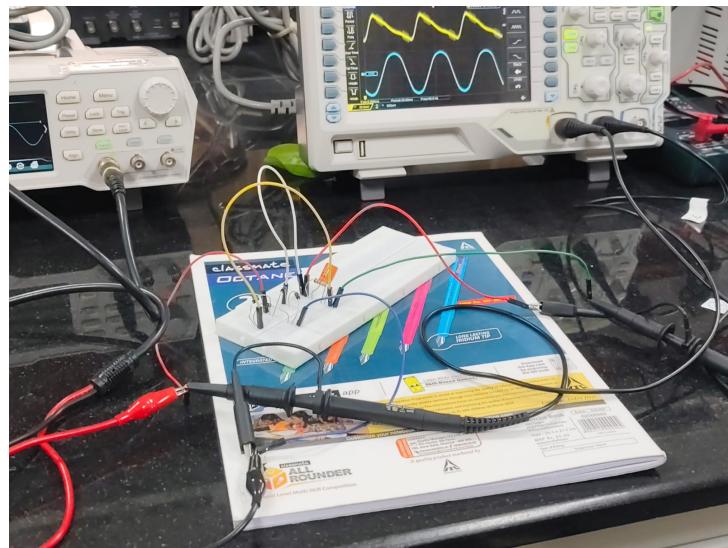


Figure 16: Experimental setup 16

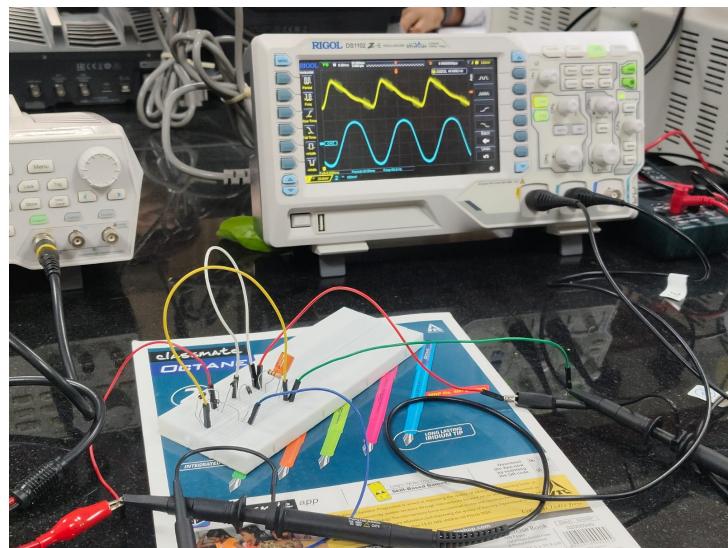


Figure 17: Experimental setup 17

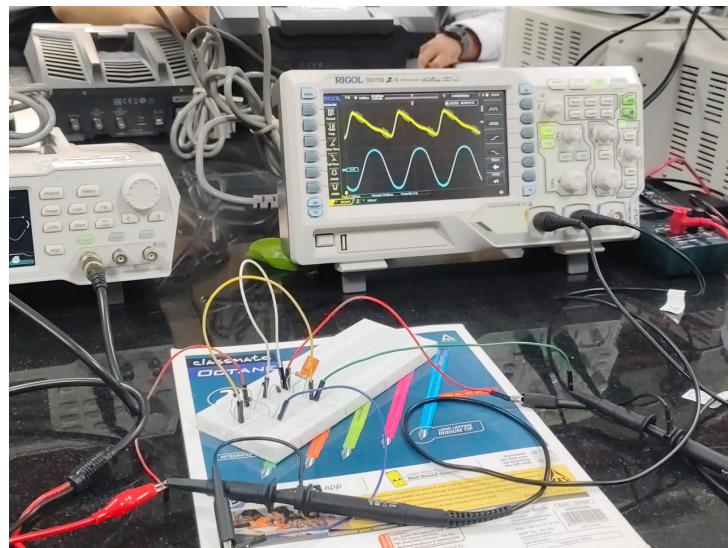


Figure 18: Experimental setup 18

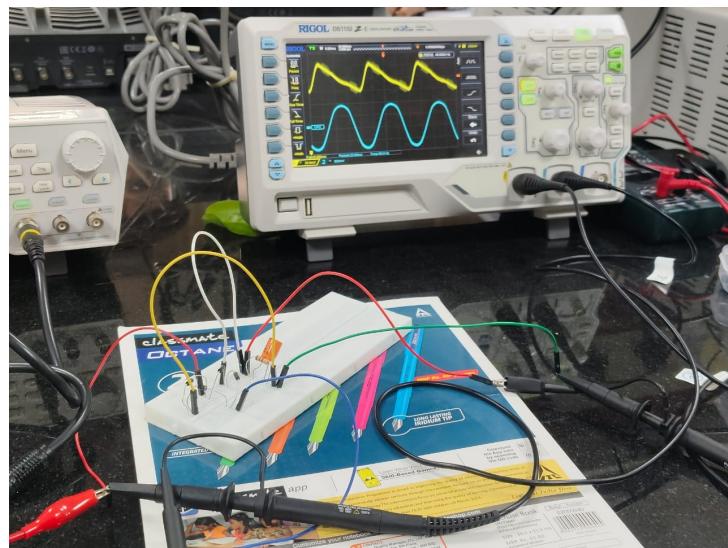


Figure 19: Experimental setup 19

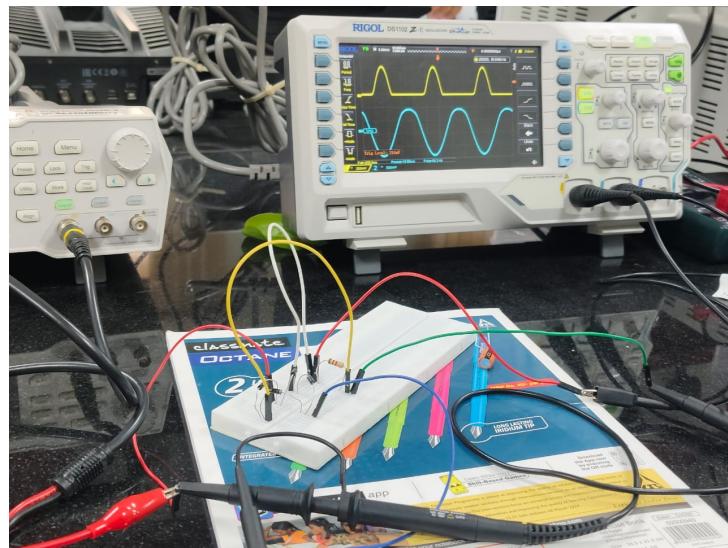


Figure 20: Experimental setup 20

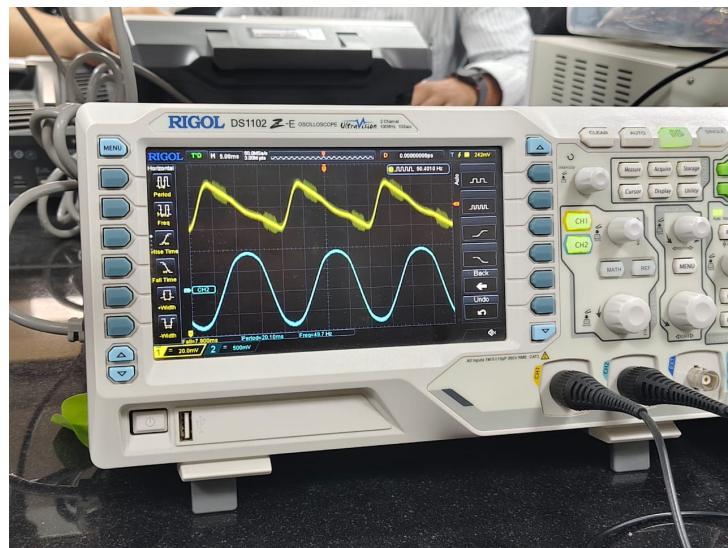


Figure 21: Experimental setup 21

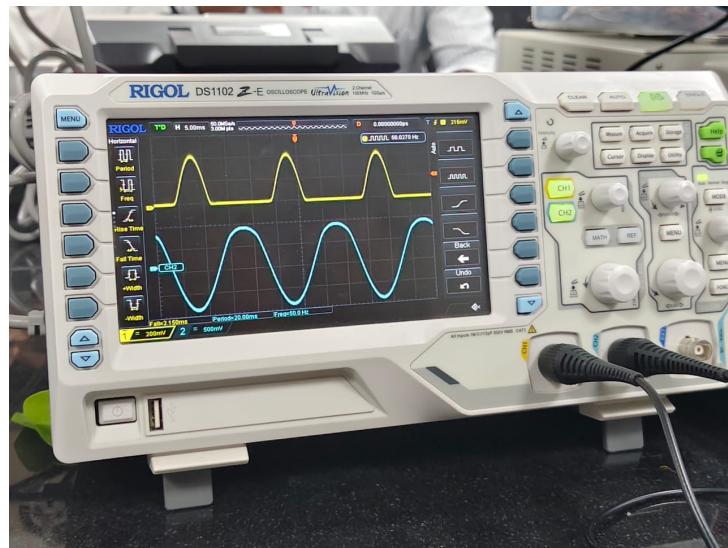


Figure 22: Experimental setup 22

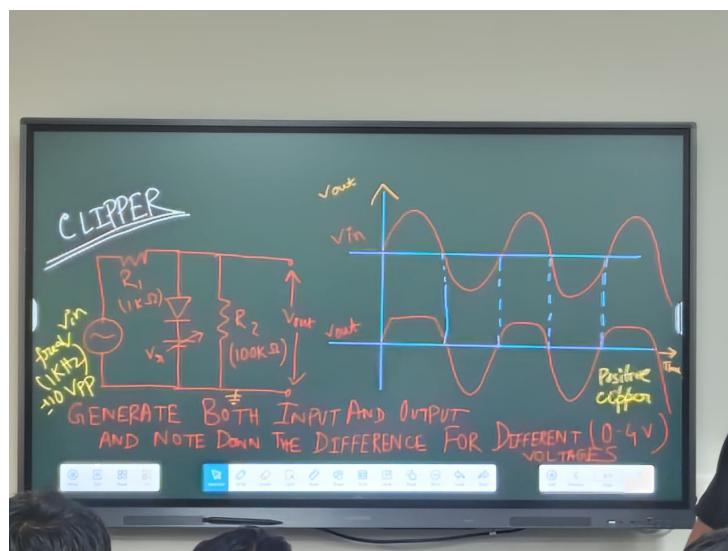


Figure 23: Experimental setup 23

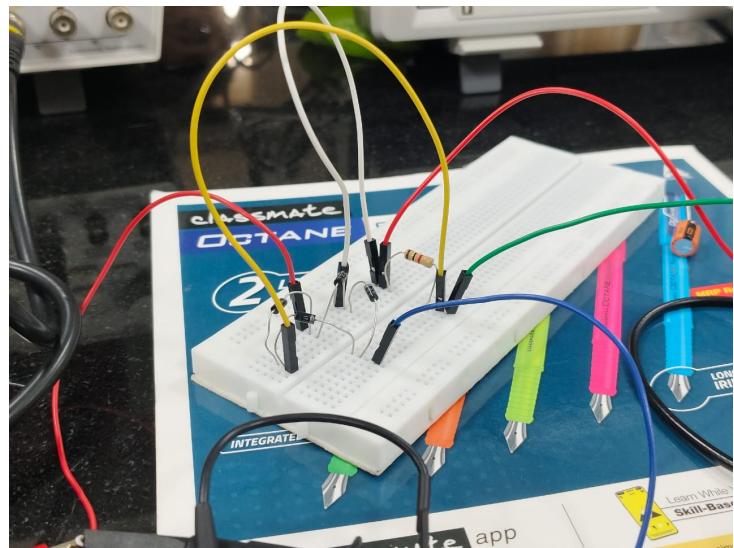


Figure 24: Experimental setup 24

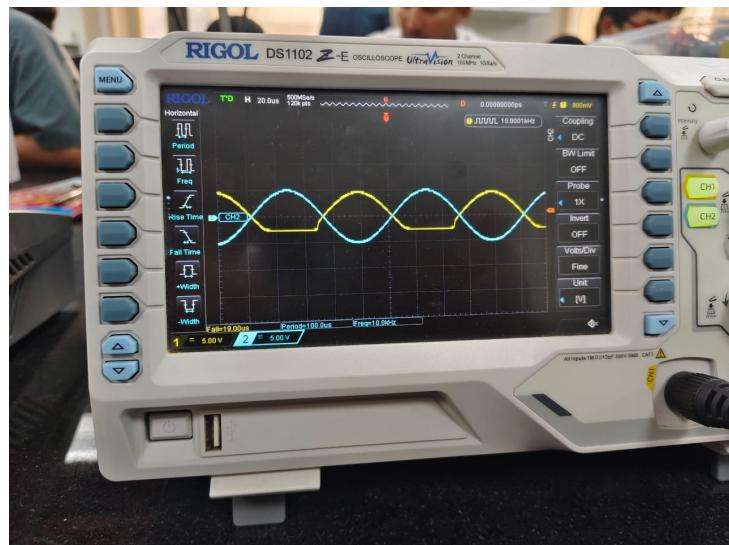


Figure 25: Experimental setup 25

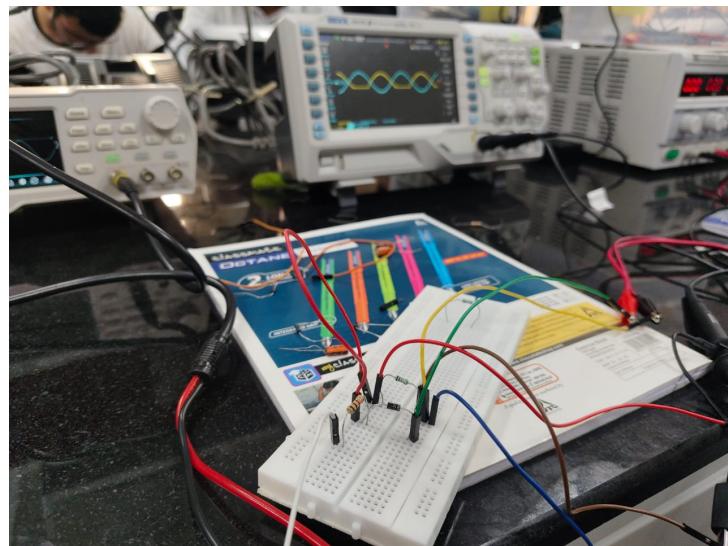


Figure 26: Experimental setup 26

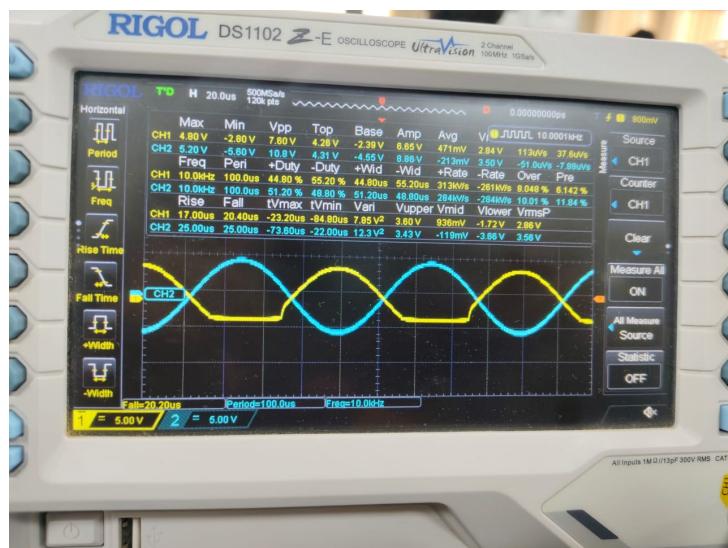


Figure 27: Experimental setup 27

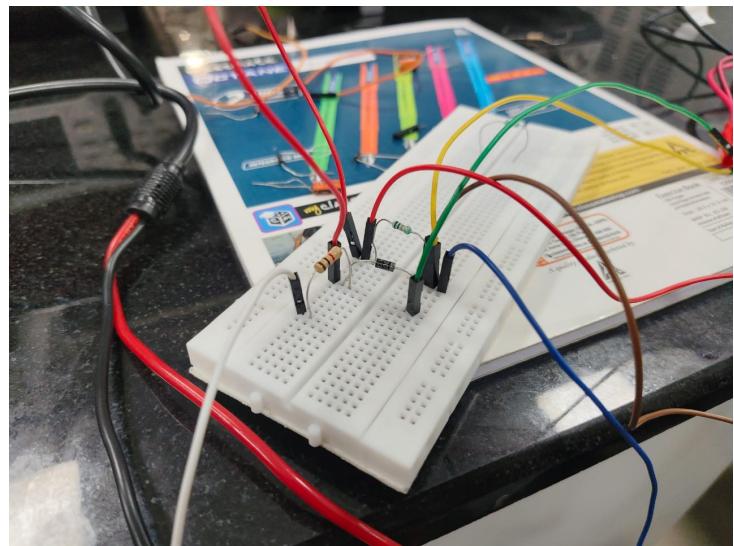


Figure 28: Experimental setup 28

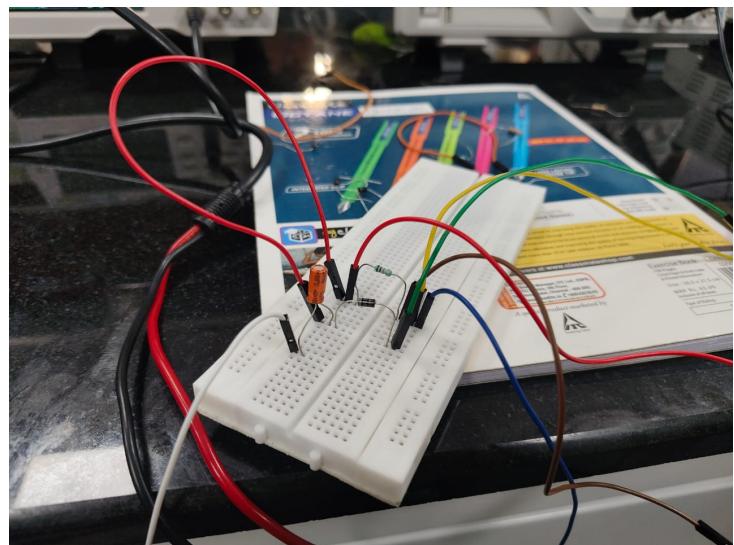


Figure 29: Experimental setup 29

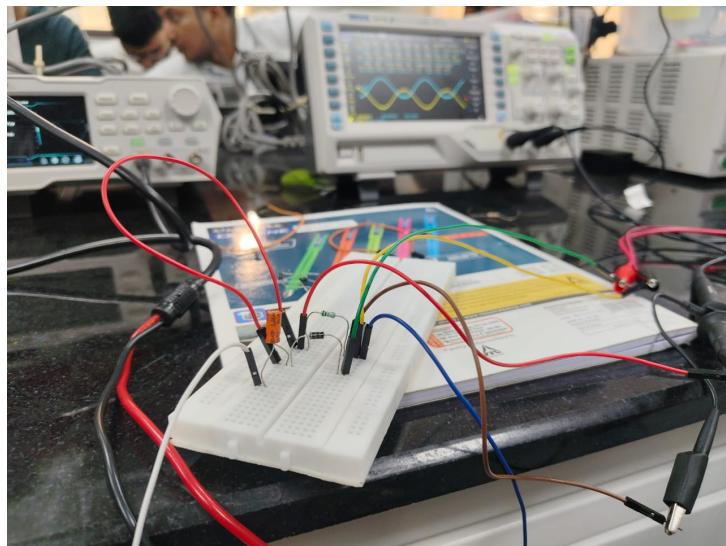


Figure 30: Experimental setup 30

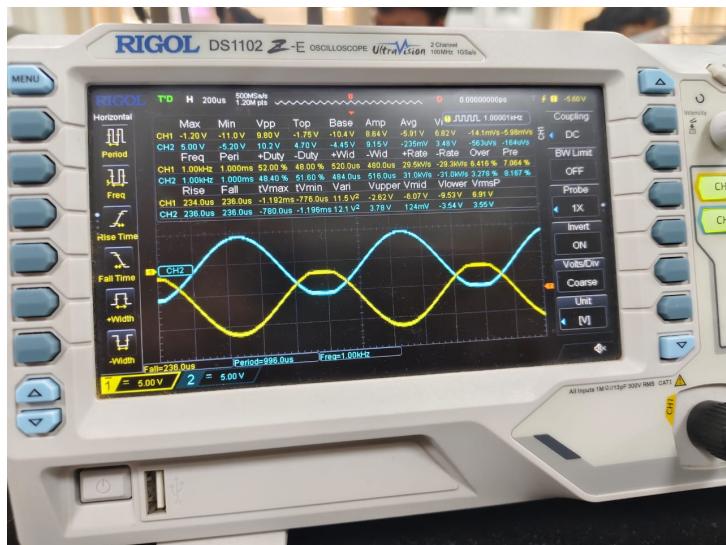


Figure 31: Experimental setup 31

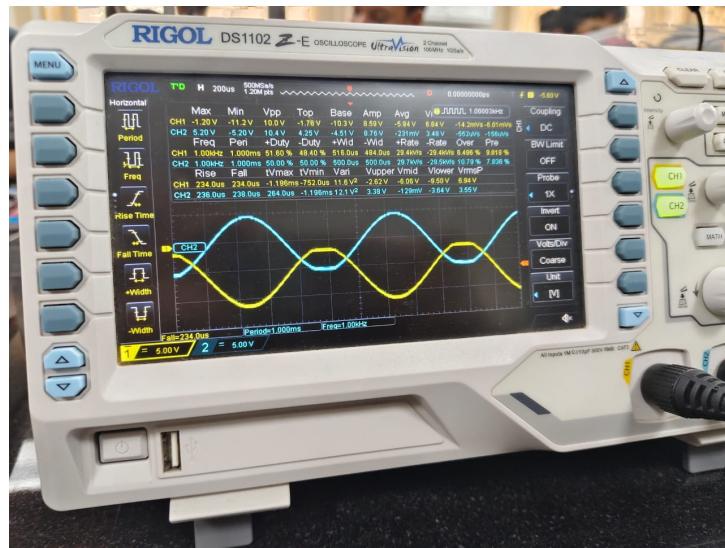


Figure 32: Experimental setup 32

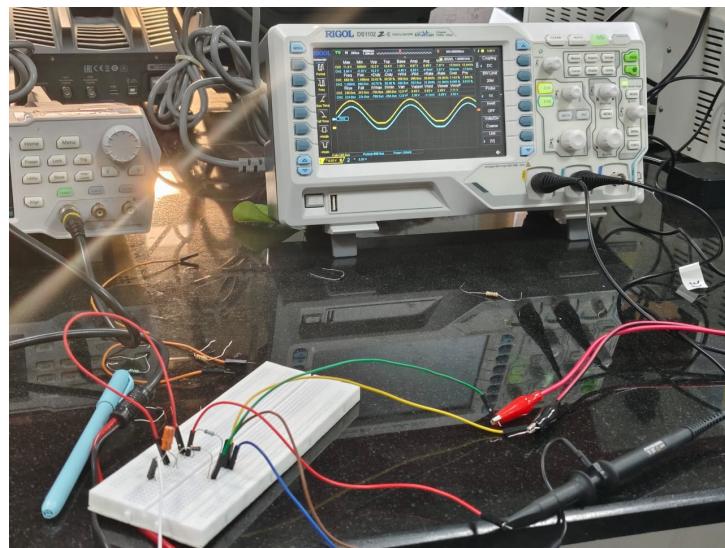


Figure 33: Experimental setup 33

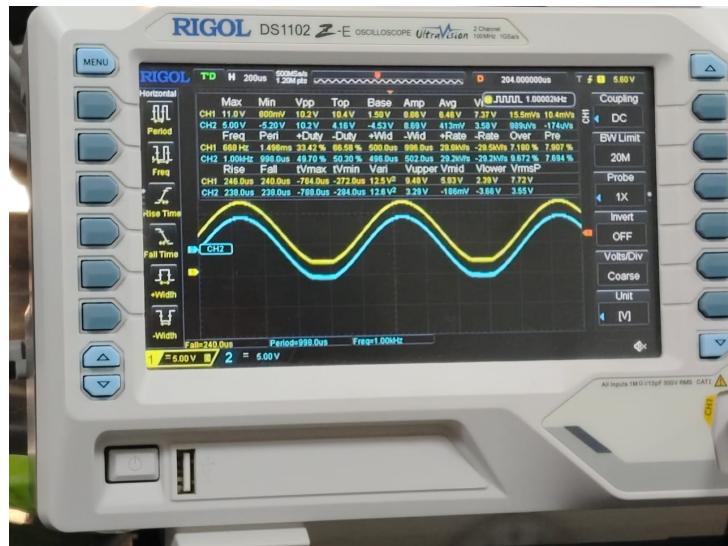


Figure 34: Experimental setup 34

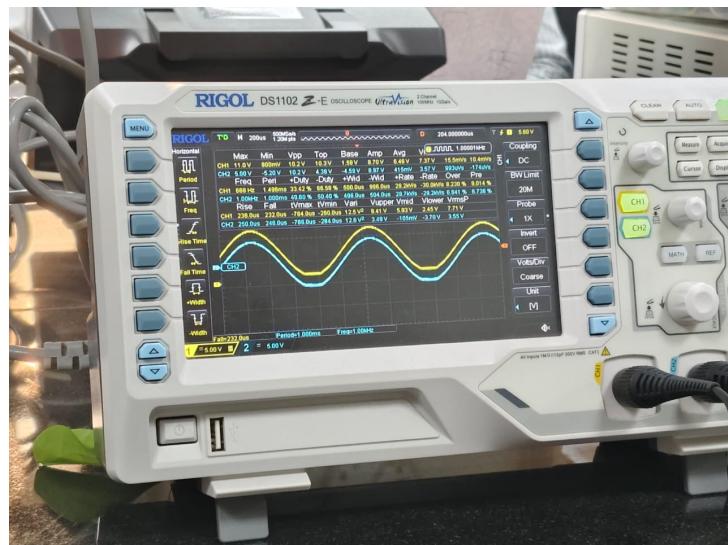


Figure 35: Experimental setup 35

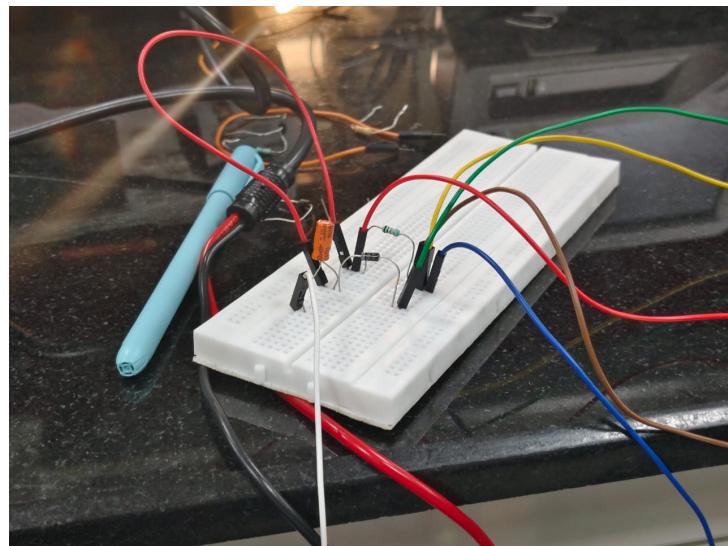


Figure 36: Experimental setup 36

5 LTspice Simulation Results

Below are the LTspice simulation images:

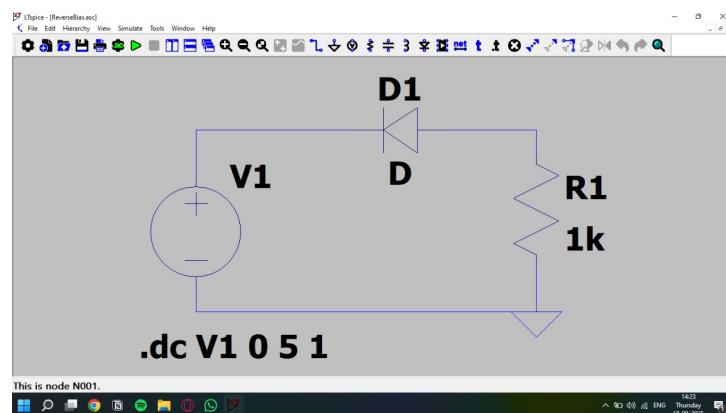


Figure 37: LTspice simulation 1

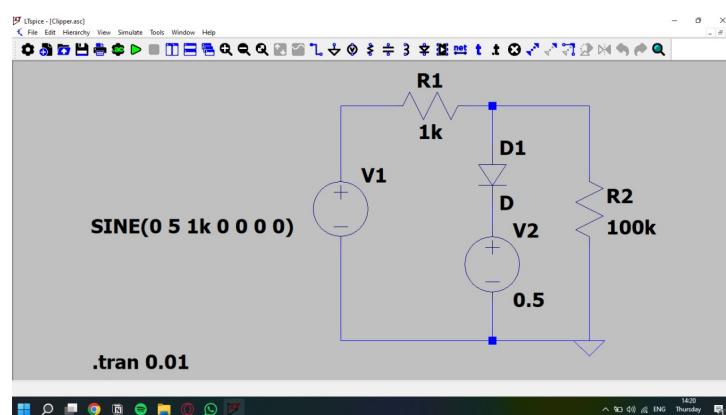


Figure 38: LTspice simulation 2

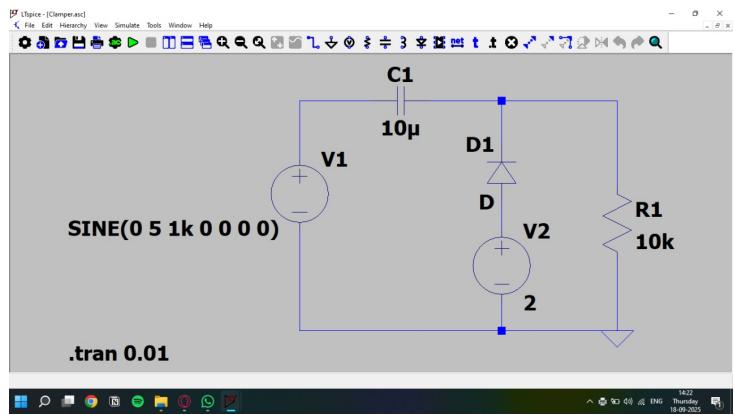


Figure 39: LTspice simulation 3

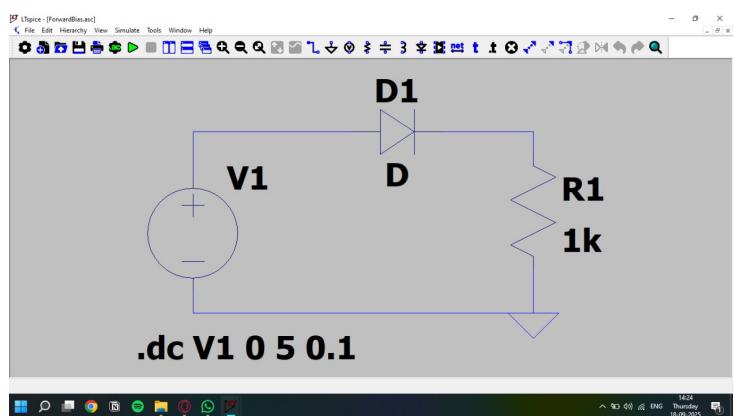


Figure 40: LTspice simulation 4

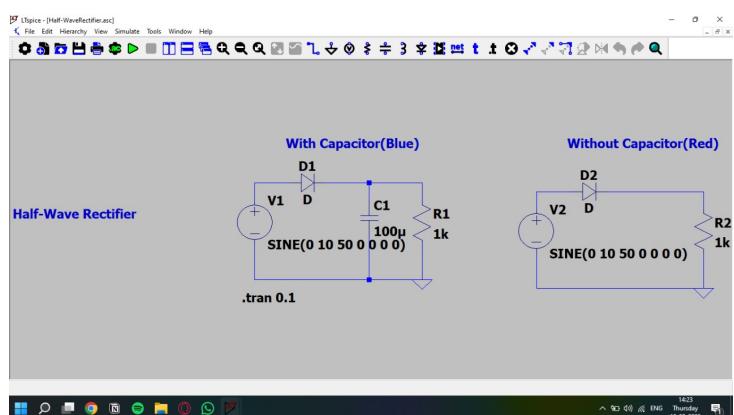


Figure 41: LTspice simulation 5

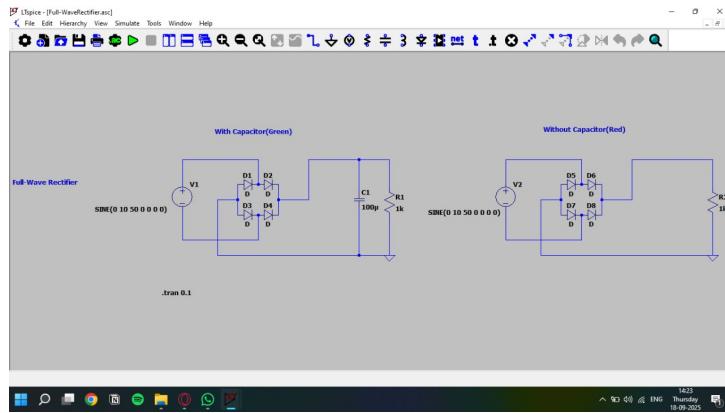


Figure 42: LTspice simulation 6

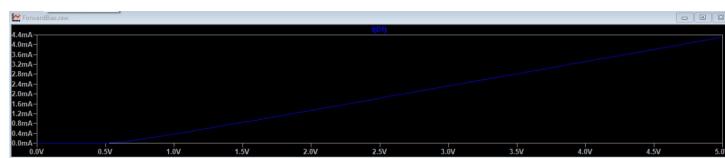


Figure 43: LTspice simulation 7

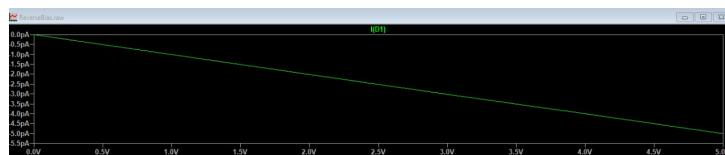


Figure 44: LTspice simulation 8

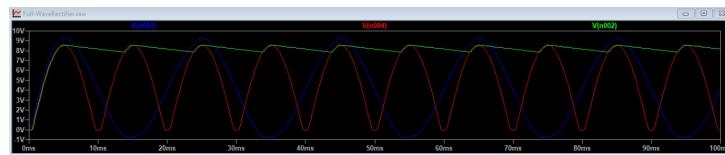


Figure 45: LTspice simulation 9

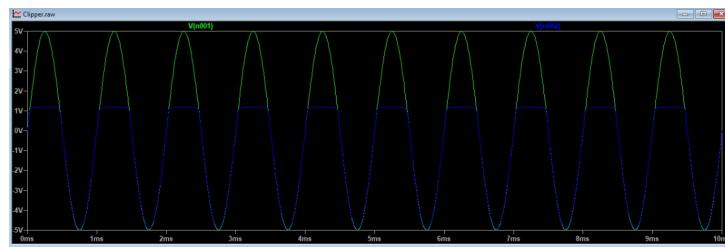


Figure 46: LTspice simulation 10

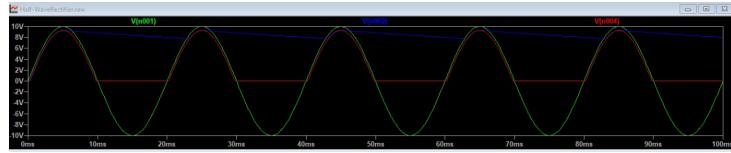


Figure 47: LTspice simulation 11

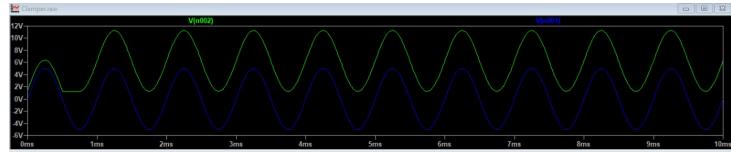


Figure 48: LTspice simulation 12

6 Observations

Below are the screenshots of the observation table recorded during the experiment:

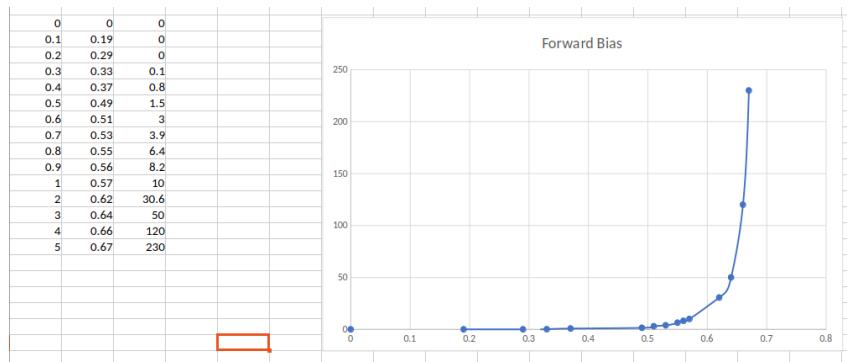


Figure 49: Observation Table 1: Forward Bias characteristics

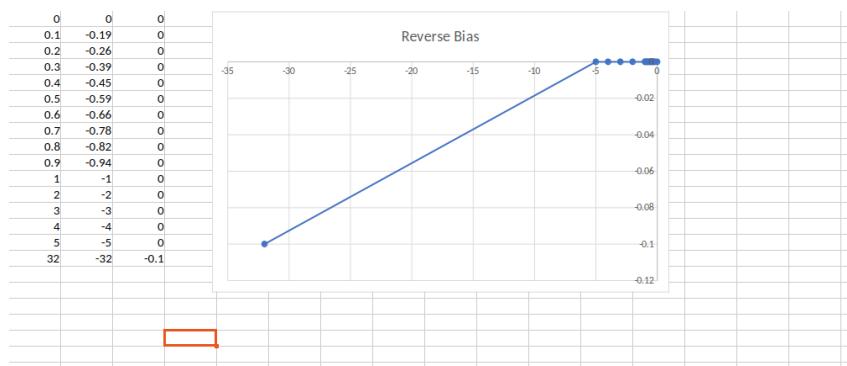


Figure 50: Observation Table 2: Reverse Bias Characteristics

Observation Summary:

- The I-V characteristics of the diode show a clear threshold voltage, beyond which the current increases rapidly, confirming the non-linear behavior of the diode.

- In the rectifier circuit, the output waveform demonstrates successful conversion of AC to DC, with the expected ripple.
- Clipper and clamper circuits modify the waveform as predicted, with the output voltage limited or shifted according to the circuit configuration.
- The experimental results closely match the LTspice simulations, validating the theoretical analysis.

7 Conclusion

The experiment successfully demonstrated the fundamental characteristics and applications of diodes. The I-V curve confirmed the diode's threshold behavior and non-linearity. Rectifier circuits were able to convert AC to DC, while clipper and clamper circuits effectively shaped the input waveform. Both experimental and simulation results were in good agreement, reinforcing the theoretical concepts. Diodes are essential components in electronic circuits for controlling and shaping electrical signals.