Experiment 01:

Experiment Name: Implementing Basic Gates(OR,AND) using NOR IC

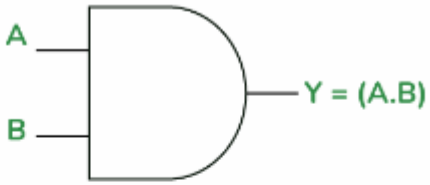
Introduction:A **NOR gate i**s called a **universal gate** because you can use it alone to create any other basic logic gate like AND, OR, NOT etc.

OR gate Truth table and circuit diagram:

Truth Table

Input A	Input B	Output
0	0	0
0	1	1
1	0	1
1	1	1

AND gate Truth table and circuit diagram:



Truth Table

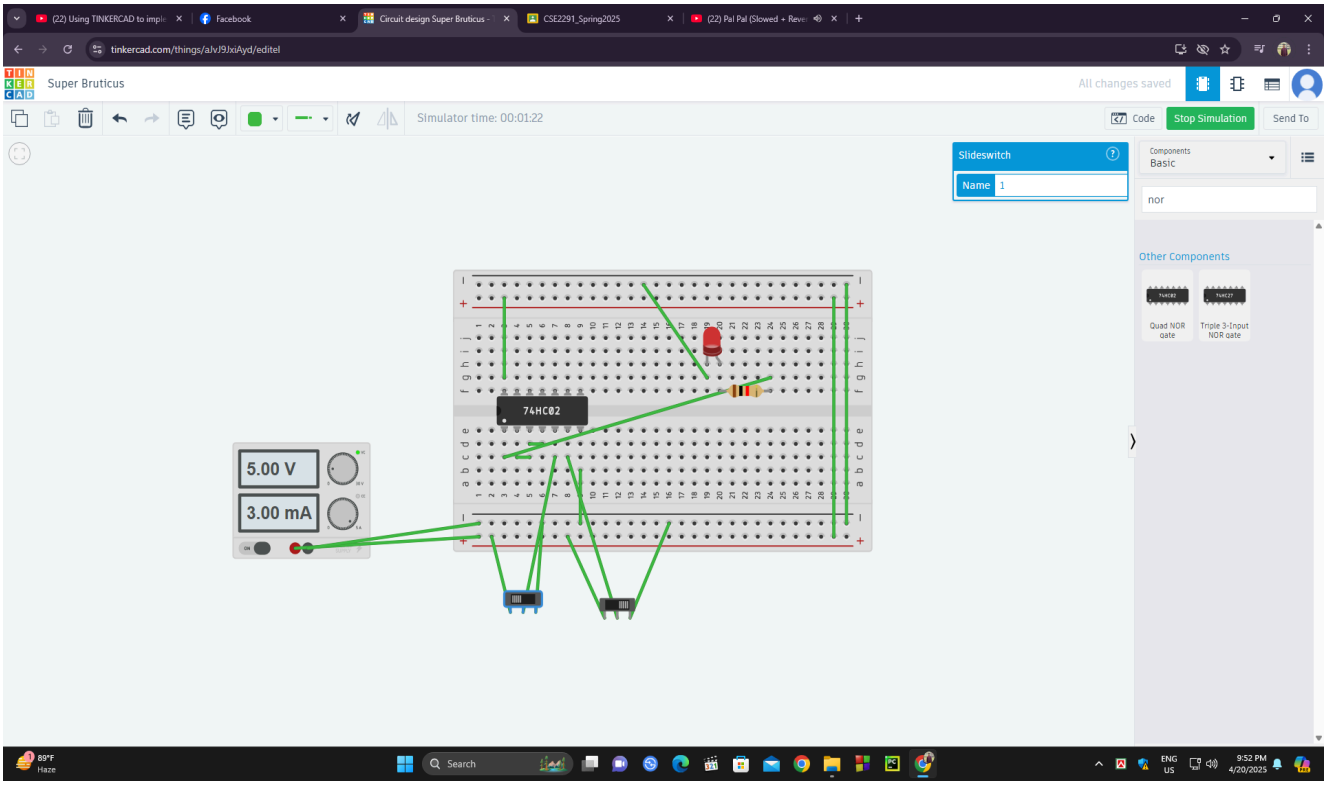
A (Input 1)	B (Input 2)	Y = (A.B)
0	0	0
0	1	0
1	0	0
1	1	1

Apparatus:

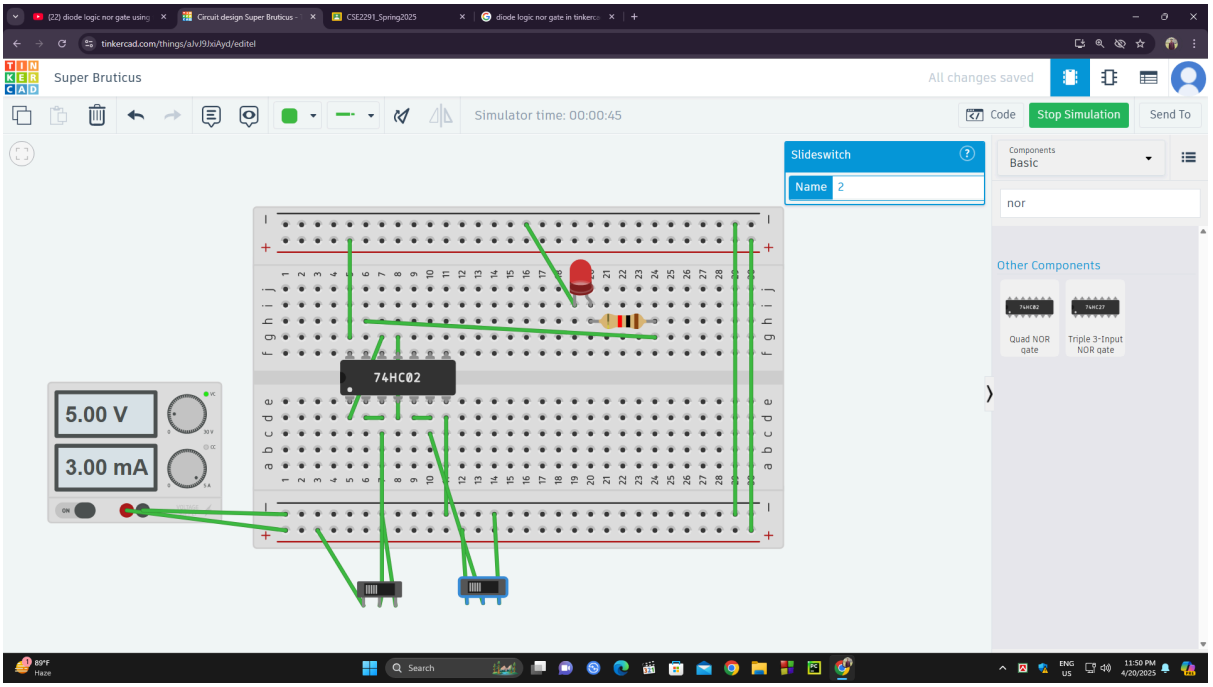
- Tinkercad simulation software
- NOR gate IC (e.g., 7402 or equivalent NOR gate)
- Breadboard (virtual in Tinkercad)
- Wires
- Power supply (5V virtual)
- Logic input switches
- LEDs (to represent output)

Experimental Setup:

1.OR gate circuit:



2.AND gate circuit:



Result and Analysis:

After building and simulating the circuits:

- For OR Gate:
    - Inputs A=0, B=0 → Output=0
    - Inputs A=0, B=1 → Output=1
    - Inputs A=1, B=0 → Output=1
    - Inputs A=1, B=1 → Output=1

Analysis: Output matches standard OR truth table.

- For AND Gate:
    - Inputs A=0, B=0 → Output=0
    - Inputs A=0, B=1 → Output=0
    - Inputs A=1, B=0 → Output=0

- Inputs A=1, B=1 → Output=1

Analysis: Output matches standard AND truth table.

Discussion:

This experiment illustrates the concept of gate universality. By combining NOR gates in specific configurations, we were able to replicate the behavior of OR and AND gates. This has practical implications in designing minimal hardware circuits using fewer types of logic ICs, which can simplify manufacturing and reduce costs. Tinkercad provided a virtual environment to visualize and test these logic gate constructions.

Conclusion:

We successfully implemented OR and AND gates using only NOR gates in the Tinkercad simulator. The output behavior of the constructed gates matched the theoretical truth tables, proving that NOR gates are universal and can replicate the functions of other basic logic gates.

Experiment 02:

Experiment Name: Implementation of a NOR Gate Using Diode Logic on Tinkercad

Introduction:
The NOR gate is a universal gate that outputs HIGH (1) only when both inputs are LOW (0). In diode logic:

- A HIGH input forward-biases the diode, pulling the output to LOW.
- If no input is HIGH, the pull-down resistor ensures the output stays HIGH.

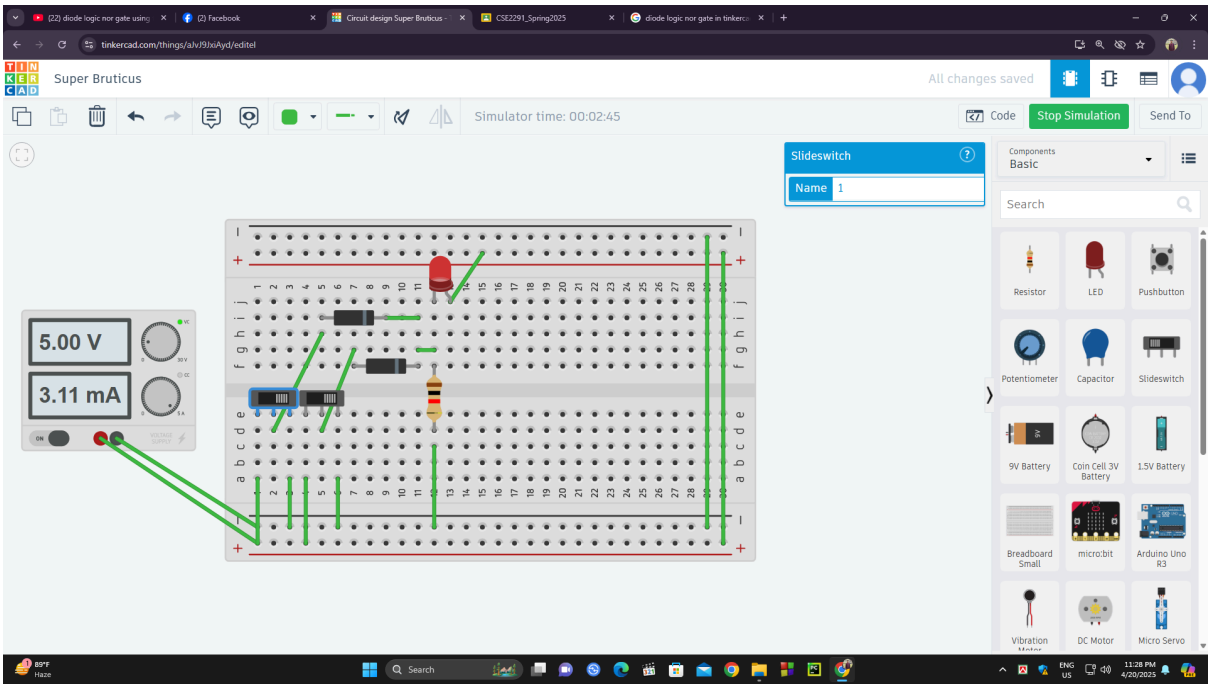
Truth Table:

A	B	D1	D2	LED	OUTPUT
0	o	R/O	R/O	ON	1
0	1	R/O	F/S	OFF	0
1	0	F/S	R/O	OFF	0
1	1	F/S	F/S	OFF	0

Apparatus:

Name of Component	Quantity
Breadboard	**1**
Push Button Switches	2
Diodes(1N4148)	2
Resistor(1KΩ)	1
LED	1
DC Power Supply(2V)	1
Connecting Wires	As required

Experimental Setup:



Result and Analysis:

Truth Table Observations:

Input A	Input B	Output (LED)	Output State
0	0	ON	HIGH (1)
0	1	OFF	LOW (0)
1	0	OFF	LOW (0)
1	1	OFF	LOW (0)

When both A and B are LOW (no buttons pressed), the output is HIGH (LED ON).
If either A or B is pressed, the output becomes LOW (LED OFF).
This behavior matches the **NOR gate truth table** perfectly.

Discussion:

The experiment demonstrated the practical working of a NOR gate using diode logic. Diodes act as one-way conductors that pull the output to LOW when forward biased by a HIGH input signal. The pull-down resistor ensures that if no diode is conducting (both inputs LOW), the output stays HIGH.

In real-world circuits, such diode-resistor logic is limited by voltage drops across the diodes and fan-out issues, but it effectively demonstrates the basic concept of logical operation without needing ICs. Also, in practical designs, voltage thresholds must be considered carefully.

Conclusion:

The implementation of a **Diode Logic NOR Gate** using Tinkercad was successful. The LED output behaved according to the NOR gate truth table. This experiment helped reinforce the understanding of fundamental digital logic concepts and demonstrated how simple components like diodes and resistors can be used to perform basic logic functions.