

**COSC 201**  
**COMPUTER ORGANIZATION AND ASSEMBLY LANGUAGE**

Lab 5 – Introduction to Digital Logic

In this lab, you will be getting some hands-on experience with digital logic circuits. For most of the semester, we will do our digital logic design in simulation, because it is much faster and easier to scale up to larger systems. However, it is important to realize that the systems we work on are real, and at some point in history were built with components not unlike the ones we will be using today.

**Lab Procedures:**

The materials we will be using today are on loan from the physics department. Please help us take care of them, so that we can continue to have these experiences for future students as well.

First, as you are wiring circuits, please leave your boards turned off. When you have finished wiring your circuit, ask an instructor or TA to quickly check your work, just to have another pair of eyes verify that there will not be any short circuits or other electrical issues that may cause damage to the equipment when power is turned on. Once the boards are turned on, feel free to play with switches and watch outputs, but avoid connecting or disconnecting wires.

When building your circuits, both with wires and in simulation, you will quickly find that good wire organization is important to avoid making mistakes and being able to understand your circuit. In addition, the wires we have available have different colors, and choosing a wiring scheme that uses similar wires for similar purposes can be helpful. In particular, having wires that are visibly identifiable as connections to power, ground, switches, displays, or gate-to-gate connections will help make your circuit much easier to understand. Additionally, try to use wires that are appropriate in length for the connection you are trying to make. You will note that there are tools available to cut wires to specific lengths. Use them, or find wires already cut to the length you want, as long wires can make a circuit harder to work with and understand. If you are unfamiliar with how to use wire strippers, ask for help, and we'll be glad to show you.

**Breadboard basics:**

Many of you may be new to the kind of equipment we will use today, so here are the basics. We will be connecting circuits using the breadboard, wires, and chips with digital logic components. The breadboard is there for helping make electrical connections. It has sections 5 holes across and sections 2 holes across. Each column of the two-hole sections is connected down its entire length – meaning any wires plugged into the same column will be electrically connected as if they were all directly touching each other. The long channels are primarily used to make connections to power and ground easily available throughout your circuit. The remaining sections of the breadboard with 5 holes across are connected across each row in those groups of five. The chips have pins that are conveniently spaces to spread across two sets of 5-hole connections, allowing us to connect inputs and outputs to the pins.