



UGANDA CHRISTIAN UNIVERSITY

A Centre of Excellence in the Heart of Africa

Faculty of Engineering, Design and Technology

Department of Computing and Technology

Workshop Practice Weekly Report 6

Recess Term: Year 1 Semester 3

Workshop Title: Recess

Lab: Digital and Analog Electronics

Student Name: Magezi Richard Elijah

Registration Number: M24B13/019

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Instructor: Mrs. Kasande Winnie Mbahanya

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1. Executive Summary

The week commenced with the completion of the prior week's laboratory exercises, which involved resolving connectivity issues. Considerable time was dedicated to troubleshooting these technical difficulties before proceeding to the study of trunking systems. We began Tuesday with a new lab focusing on digital and analog electronics was conducted under the supervision of Mr. Phillip Atwine. This session encompassed the construction of fundamental digital circuits, the measurement of voltage levels across various states, and an examination of their operational principles. The construction of combined logic gates facilitated a more comprehensive understanding of digital electronics, including arithmetic logic units (ALUs) and adder circuits. Further topics were explored, though these constituted the primary focus. The next comprised of an introductory lecture on analog electronics was presented by Mr. Ainebyona Savior David. The week thus comprised a combination of practical laboratory work and theoretical instruction, covering both digital and analog electronic systems.

2. Objectives of the Week

1. Objective 1: Understanding Digital and Analog electronics and circuits.
2. Objective 2: Carrying out experiments on differnt to of digital and analog circuits.

3. Activities Undertaken

3.1 Activity 1: Wrapping up the previous weeks lab (Date: February 17, 2025)

- **Description:** On this day we finished setting up the electrical installation and after a few failed tries we troubleshot the system and got some

of the switches to work. We then had to troubleshoot again to get the whole system to work. This involved rechecking connections at junctions, sockets and switches. After discovering the problem, which was a wrong connection, we fixed it and tested the electrical system again and we had no further issues since it worked. The next step was to cover up the wire in the trunking which was handled quickly and we tested the electrical system again to make sure it worked properly which it did.

- **Tools/Resources Used:** Screwdrivers, cutters, pliers and a bow saw.
- **Challenges Encountered:** The whole system refused to turn on because some electrical wires had disconnected. Not enough materials to go around like masking tape and light bulbs. Lack of enough time to fully immerse ourselves into the concept of electrical wiring.
- **Learning Insights:** : Wires should not be naked especially when they are connecting to the switches or sockets. Some switches do not need to carry as much load as others in the circuit.

3.2 Activity 2: Introduction to Digital and Analog Electronics (Date: February 18, 2025)

- **Description:** Mr. Phillip Atwine was our instructor as we began the lab on digital and analog electronics. We started with the basics of digital electronics, how they work through 0s and 1s and how they apply in simple circuits. We then learnt about number systems in digital electronics, did some conversions like binary to hexadecimal, hexadecimal to binary and learned about logic gates, their different types and how they work. The next concept that was introduced to us was integrated circuits and their working. We then used a digital circuit experiment case to carry

out different simple integrated circuit experiments in which we measured voltage produced at different states. Lastly Mr. Phillip taught us the relevance of what we were learning in this class which was mainly data storage and processing.

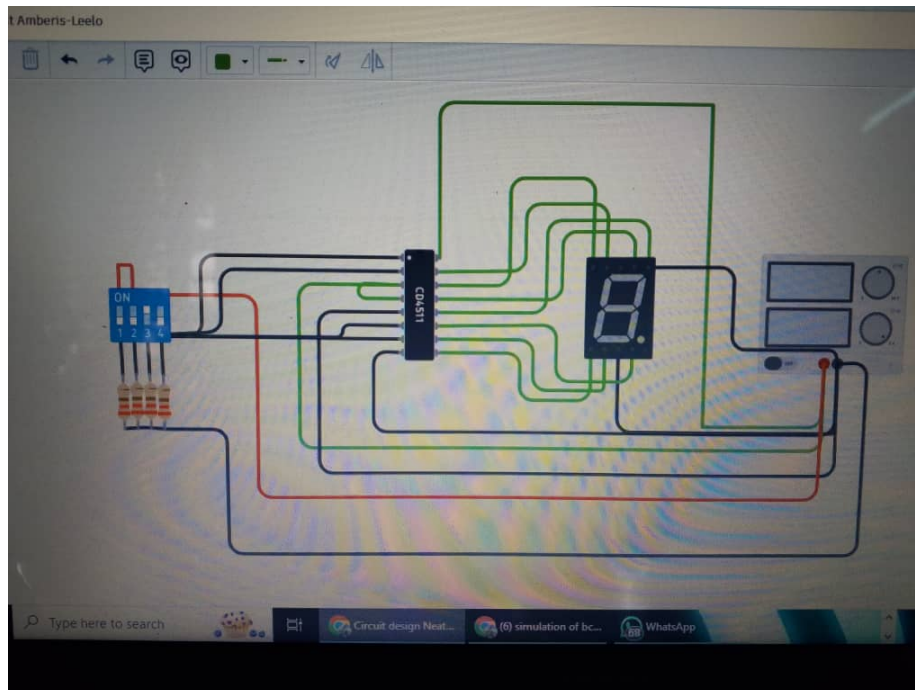
- **Tools/Resources Used:** Digital circuit experiment case, wires, voltmeter and integrated circuits
- **Challenges Encountered:** Installing and removing the integrated circuits without damaging them. Understanding the different concepts involved with digital circuits. Proper wiring to make sure the circuit works.
- **Learning Insights:** It is best to make intersections outside and not at the port in the case. An analog-to-digital converter converts analog information into digital information. To get the schematics for an integrated circuit one should Google the number written on top of it. The grounding and are usually in the same place on most integrated circuits. Different combinations of logic gates can act as AND, NOR and OR gates. Full Adder and half adders are mainly used in data storage and processing.

3.3 Activity 3: Finding the switching characteristics and applications of Diodes and combinational circuit experiments (Date: February 19, 2025)

- **Description:** We began the activity with a brief introduction to diodes after which we were given an experiment to carry out in which we had to find the voltammetric characteristics of the given diode. We then did a second experiment on combinational logic circuits, which required the use of more than one integrated circuit. Mr. Phillip guided us through the basics of TinkerCad which is a simulation environment to create small

circuits on a computer after which we were given an assignment to create a BCD to 7 segment display decoder using logic gates in the simulated environment

- **Tools/Resources Used:** Digital circuit experiment case, wires, multi-meter and integrated circuits.
- **Challenges Encountered:** Lack of enough digital multimeters to go around. The analog multimeters produced incorrect measurements. Confusion when making connections for the logic gates.
- **Learning Insights:** Integrated circuits must be handled with care to avoid damage to them. All recorded values must be proved to make sure they are correct during experiments. Nand gates are represented by the =1 symbol and XOR gates are represented by the =1 symbol.



3.4 Activity 4: Introduction to Analog electronics (Date: February 20, 2025)

- **Description:** Mr. Ainebyona Savior David was our supervisor during this activity. The first thing we learned about was how the analog signal travels, which is a sine wave or a cosine wave. The next thing we were taught about were components dealing with analog which were categorized in passive and active components. We began with the passive components which involved resistors and capacitors. Under capacitors we learned about the different capacitors like the ceramic, electrolytic, film, super, variable among others
- **Tools/Resources Used:** Pen and paper
- **Challenges Encountered:** Understanding the differences between certain types of capacitors.
- **Learning Insights:** Super capacitors are mostly used in large machinery which need a lot of power at once. Electrolytic capacitors are the most largely used group of capacitors.

3.5 Activity 5: Practical session on analog electronics (Date: February 21, 2025)

- **Description:** In the last activity for this lab of digital and analog electronics we had a practical in which we carried out experiments starting with one in which we had to understand the debugging method of a static working points of an amplifier and the testing method of amplification of amplifier's voltage.
- **Tools/Resources Used:** Electrical test box, multimeter, oscilloscope, AC millivolt-meter.

- **Challenges Encountered:** Understanding how the signals were to be created. Faulty tuning knobs making it had to achieve the desired signal.
- **Learning Insights:** Connecting transistors in series allows for AC current and block DC and in parallel does the vice versa.

4. Learning Outcomes

- **Technical Skills Developed:** Trouble shooting electrical installation connections, Combination gate construction, Digital Circuit design and Understanding Arithmetic Logic Units.
- **Conceptual Understanding:** The differences between Analog and digital circuits and components involved in each.
- **Methodological Insights:** Building and testing circuits and understanding why they work the way they do.

5. Reflections

During the past week, we bridged the gap between the theory and practical involving logic gates to some degree. We also gained a deeper appreciation for the fundamental building blocks of complex computer systems and the role of technology in society.

6. Action Plan for Next Week

- **Review Materials:** Zlibrary, CompTIA, Notes made during class.
- **Skill Development:** Understanding of Arithmetic logic Units
- **Preparatory Tasks:** Preparing for the next labs at UIRI in Embedded systems.

7. Appendices

