

Learning Guide Unit 2

Reading Assignment

As you read through the resources and watch the videos, consider the following:

- What are combinational circuits, and how do they differ from sequential circuits?
- Explain the fundamental principles behind the operation of combinational circuits. How do they process input signals to generate output signals?
- Define multiplexers, decoders, encoders, and de-multiplexors. How do these components enhance the functionality and flexibility of combinational circuits?

Textbook:

1. Ndjountche, T. (2016). *Digital electronics 1: Combinational logic circuits*. John Wiley & Sons, Incorporated.

- Log into the UoPeople library and go to LIRN. Click on Access to Library and Information Resource Network, go to Computer Science and click on EBook Central. Search for the entire name of the ebook. Use the Learning Resource Center to read on how to use the online library.
- Read Chapter 3: Function Blocks of Combinational Logic (pp.129-182)
 - Section 3.1: Introduction
 - Section 3.2: Multiplexer
 - Section 3.3: Demultiplexer and Decoder
 - Section 3.4: Implementation of logic functions using multiplexers or decoders
 - Section 3.5: Encoders
 - Section 3.6: Transcoders
 - Section 3.7: Parity Check generator
 - Section 3.8: Barrel Shifter
- Sections 3.1 & 3.2: These sections introduce function blocks in combinational logic, highlighting their role in processing input data and producing outputs through logic operations.
It explores the multiplexer (MUX), a versatile component that, guided by control signals, selects a single output from multiple inputs. Its applications encompass data routing and selection, making it vital in digital systems for efficient data management and control.
- Sections 3.3 & 3.4: These sections dive into demultiplexers, which reverse the operation of a multiplexer. You will be able to understand how decoders, a specialized kind of demultiplexer, decode binary information to control multiple outputs. You will also explore how these components facilitate efficient implementation of logic functions in digital circuits.
- Section 3.5: After this reading, you will gain an understanding about encoders, devices that compress multiple inputs into a smaller set of outputs and learn how these components aid in data compression and transmission, streamlining digital communication systems.
- Section 3.6: This section talks about uncovering transcoders, devices that convert information from one code to another and delve into their practical application in data processing and communication systems.
- Section 3.7: You will discover the Parity Check Generator, a crucial component in error detection and understand how this generator ensures data integrity by detecting and flagging errors in transmitted information.
- Section 3.8: This reading will engage you with the concept of Barrel Shifters, devices that enable efficient shifting and rotation of binary data and also explore their applications in arithmetic operations and data manipulation.

2. Read Chapter 4: Systematic Methods for the simplification of Logic Functions (pp.222-260)

- Section 4.1: Introduction
- Section 4.2: Definitions and reminders

- Section 4.3: Karnaugh maps
- Section 4.4: Systematic methods for simplification
- Sections 4.1 & 4.2: These sections introduce Systematic Methods for the Simplification of Logic Functions which is a crucial aspect of digital circuit design. You will gain an insight into the importance of simplifying logic functions and the role it plays in optimizing circuit efficiency. Review key definitions and reminders that lay the foundation for further exploration.
- Sections 4.3 & 4.4: These readings will help you delve into Karnaugh Maps, a visual tool used for simplifying Boolean expressions. They will help you understand how Karnaugh Maps provide a systematic approach to minimizing logic functions. You will also explore various techniques employed in Systematic Methods for Simplification, uncovering systematic methodologies that enhance logical analysis and circuit optimization.

Videos:

1. APDahlen. (2021, February 21). *Digital logic #7: Combinational logic including the encoder, decoder, and multiplexer* [Video]. YouTube.

- This comprehensive video explores the essentials of digital circuitry with a focus on Multiplexers, Encoders, and Decoders to achieve better insights into the topic.

