

## 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.

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**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.

