# TKU212142

Digital Systems Engineering

Teknik Digital

## BASIC INFORMATION

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|---|---|
| **Course Credit** | 2 / 100 minutes per Week |
| **Course Type** | Required |
| **Course Classification** | Engineering Topics |
| **Prerequisites** | Discrete Mathematics |

## STUDENT AND LEARNING OUTCOMES

**Covered Student Outcomes**

Fundamental and Engineering Knowledge (KP.1) Development of Engineering Solution (KP.2)

**Learning Outcomes**

**LO1** Students are able to present and analyze digital systems.

**LO2** Students are able to construct Boolean Equations or expressions and minimize Boolean Functions.

**LO3** Students are able to design combinatorial circuit and sequential circuit.

**LO4** Students are able to design digital systems based on PLD (Programmable Logic Device) tools.

## COURSE DESCRIPTION

Digital Systems Engineering course covers digital design topics such as Digital Logic, Boolean Algebra, Combinational & Sequential Logic Circuit and Programmable Logic Devices. This course lies the foundation for advanced digital systems such as computer processor that will be learnt later in Microprocessor system course. Students is required to take Discrete Mathematics course before taking this course.

## TOPICS

**1. Introduction**

1.1 Digital vs Analog System

1.2 Combinational vs Sequential

**2. Numeral System and Binary Codes**

2.1 Numeral System

2.2 Binary Codes

**3. Boolean Algebra**

3.1 Basic Theorems and Properties

3.2 Logic Gates

3.3 Combinational Logic and Truth Table

**4. Combinational Logic Circuit**

4.1 Introduction to Digital IC

4.2 Implementation of Combinational Logic Functions

4.3 Simplification of Combinational Logic Circuit

4.4 Hazard in Combinational Logic Circuit

**5. MSI Combinational Modules**

5.1 Decoder-Encoder

5.2 Multiplexer-Demultiplexer

5.3 Arithmetic Module

**6. Sequential Logic Circuit**

6.1 Latch

6.2 Flip-Flop

6.3 Register

6.4 Counter

6.5 Hazard in Sequential Logic Circuit

**7. Programmable Logic Devices**

7.1 ROM/PROM

7.2 PLA/PAL

7.3 CPLD/FPGA

## REFERENCES

[1] Tocci, R.J., Widmer, N.S., 1998, Digital Systems Principles and Applications, Prentice-Hall, Inc., New Jersey

[2] Moris Mano, M., Ciletti, M.D., 2013, Digital Design with an Intruduction to the Verilog HDL, fifth ed. Pearson Education, Inc., publishing as Prentice Hall, New Jersey