# **Unit 4.1: Introduction to State Machines**

Content Area:	Science
Course(s):	Digital Electro
Time Period:	Semester 2
Length:	3 weeks
Status:	Published

#### **Standards**

TEC.9-12.8.1.12.B	Creativity and Innovation
TEC.9-12.8.1.12.F	Critical Thinking, Problem Solving, and Decision Making

## **Enduring Understandings**

#### Understandings

Students will understand that ...

- 1. A state machine is a circuit design that sequences through a set of predetermined states controlled by a clock and other input signals.
- 2. A state machine is designed through the creation of a state graph and a state transition table.
- 3. State machines can be implemented using small and medium scale integrated gates and programmable logic devices.
- 4. State machines are used to control common everyday devices such as elevator doors, traffic lights, and combinational (electronics) locks.
- 5. There are many sensor inputs and outputs other than LEDs and seven-segment displays in real world systems.

#### **Essential Questions**

Students will keep considering ...

- 1. Why are state machine designs used in electronics?
- 2. What are the common components of a state machine and how are they arranged to make state transitions based on inputs?
- 3. What are some common everyday devices that are controlled by state machines?

## Knowledge and Skills Knowledge

Students will ...

- 1. Understand the basic function of a state machine.
- 2. Identify the parts of a state graph and a state transition table.
- 3. Recognize a state machine and identify examples of a state machine.
- 4. Recognize a wide range of sensor inputs and outputs in real-word systems.

## Skills

Students will ...

- 1. Describe the components of a state machine.
- 2. Draw a state graph and construct a state transition table for a state machine.
- 3. Derive a state machine's Boolean equations from its state transition table.
- 4. Implement Boolean equations into a functional state machine.
- 5. Use Circuit Design Software (CDS) and a PLD to simulate and prototype state machine designs implemented with discrete and programmable logic.

## Assessments

https://docs.google.com/document/d/1wR7bQF-8AQoRrt0g4C3hKja0yjwDjC9\_BiAmONWbTcI/edit?usp=sharing

# **Modifications**

https://docs.google.com/document/d/10DqaPP69YkcFiyG72fIT8XsUIe3K1VSG7nxuc4CpCec/edit?usp=shar ing

## Resources

## **Technology Resources**

- National Instruments Multiim circuit design and simulation software
- Microsoft Office Applications

## **Electronics Resources**

- Electronics Trainers (power supply, function generator, breadboard)
- Electronics hand tools (diagonal cutters, needle-nosed pliers, wire strippers, etc.)
- Digital Multimeters
- Digital Transistor-Transistor Logic (TTL) integrated circuits
- TTL Chip Checker
- Dual Channel Oscilloscope
- Digital/Analog Function Generator