Digital Circuit Design

Lan-Da Van (范倫達), *Ph. D.*
Department of Computer Science
National Yang Ming Chiao Tung University
Taiwan, R.O.C.
Spring, 2024

ldvan@cs.nycu.edu.tw

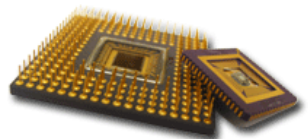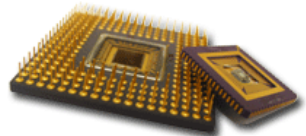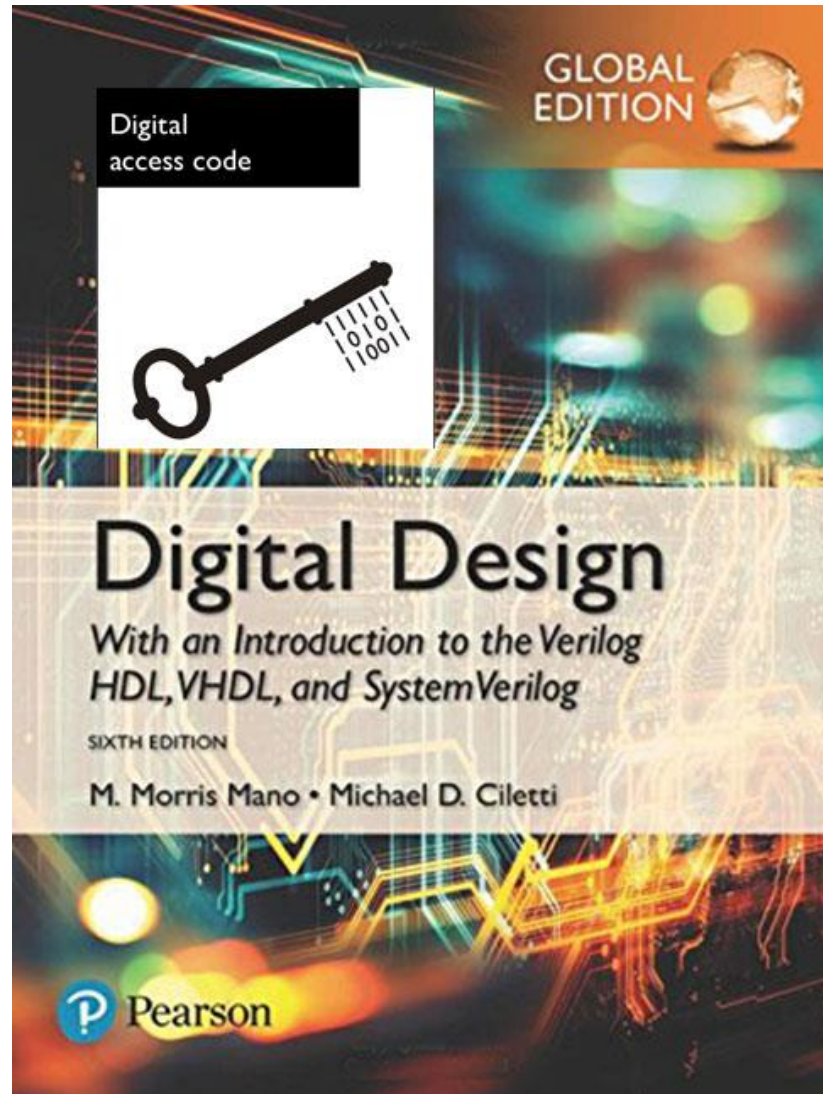http://www.cs.nctu.edu.tw/~ldvan/

Text Book (1/2)

- **M. Morris Mano and Michael D. Ciletti, *Digital Design*, 6th Edition, 2019, Pearson Education Limited.**

- **Authors:**

  - **M. Morris Mano, *Ph. D.***

  - ***California State University, Los Angeles***

  - **Michael D. Ciletti, *Ph. D.***

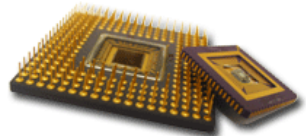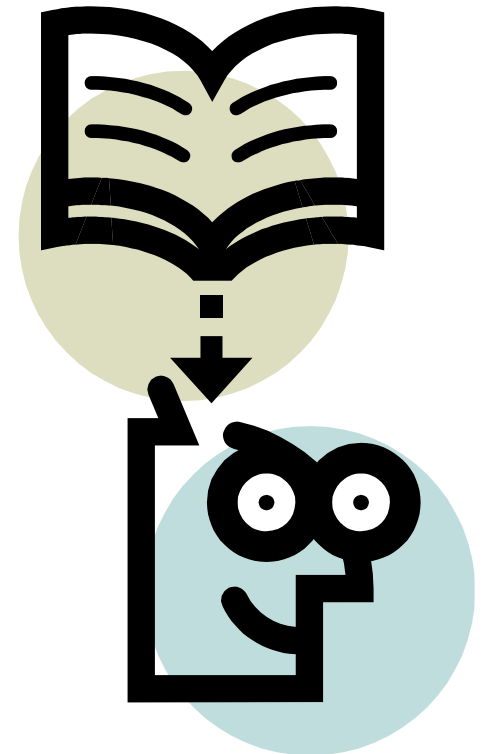 - ***University of Colorado at Colorado Springs***

Text Book (2/2)

Course Goal

- Introduce the **logic concepts** for the **digital system design**
- Undergraduate for one semester

Syllabus (1/3)

- **Lecture 1** Digital Systems and Binary Numbers
  - Digital Systems
  - Binary Numbers
  - Number-Base Conversion
  - Binary Logic

- **Lecture 2** Boolean Algebra and Logic Gates
  - Basic Theorems and Properties of Boolean Algebra
  - Boolean Functions
  - Canonical and Standard Forms
  - Digital Logic Gates

- **Lecture 3** Gate-Level Minimization
  - The Map Method
  - Product of Sums Simplification
  - Don't-Care Conditions
  - NAND and NOR Implementation
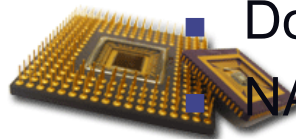
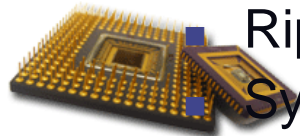# Syllabus (2/3)

- **Lecture 4** Combinational Logic
  - Combinational Circuits
  - Design Procedure
  - Binary Adder-Subtractor / Decimal Adder
  - Binary Multiplier
  - Decoder/Encoder/Multiplexer
- **Lecture 5** Synchronous Sequential Logic
  - Latches
  - Flip-Flops
  - State Reduction and Assignment
  - Design Procedure
- **Lecture 6** Registers and Counters
  - Registers
  - Shift Register
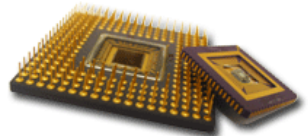 - Ripple Counter
  - Synchronous Counter

Syllabus (3/3)

- **Lecture 7** Memory and Programmable Logic
  - RAM
  - Memory Decoding
  - ROM
  - Programmable Logic Array
  - Programmable Array Logic

Scoring

- ◆ Office Hour: Monday A, B.
- ◆ Scoring
  - First Exam (around 6th week): 25%
  - Second Exam (around 11th week): 25%
  - Final Exam (around 16th week): 30%
  - Quiz (randomly happen): 20%
  - Total: 100%

- ◆ Material Web-Site:
  - http://viplab.cs.nctu.edu.tw/course/DCD2024_Spring.php
- ◆ Teaching Assistant:
  - (ext: 54742)