

# Digital Systems Design and Laboratory

## [ 21. Course Summary ]

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# Course Material

## □ First Half

- [1] Number Systems and Conversion
- [2] Boolean Algebra
- [3] Boolean Algebra (Continued)
- [4] Applications of Boolean Algebra
- [5] Karnaugh Maps
- [6] Quine-McCluskey Method
- [7] Multi-Level Gate Circuits
- [8] Combinational Circuit Design

## □ Second Half

- [9] Multiplexers, Decoders, and Programmable Logic Devices
- [11] Latches and Flip-Flops
- [12] Registers and Counters
- [13] Analysis of Clocked Sequential Circuits
- [14] Derivation of State Graphs and Tables
- [15] Reduction of State Tables
- [16] Sequential Circuit Design

# Reasons of Taking This Course

- ❑ Get some units to graduate

- ❑ Learn fundamental knowledge of "logic" and "hardware"

- Let's talk about my recruiting experience at CKSH...
- You should be better than a pure software programmer
  - Software is running on hardware
  - Hardware implementation is usually faster than software implementation
    - Disadvantage?
- You may work in the "hardware" industry in Taiwan
  - No matter what your role (software engineer, system engineer, hardware engineer, etc.) is

- ❑ Broaden your vision

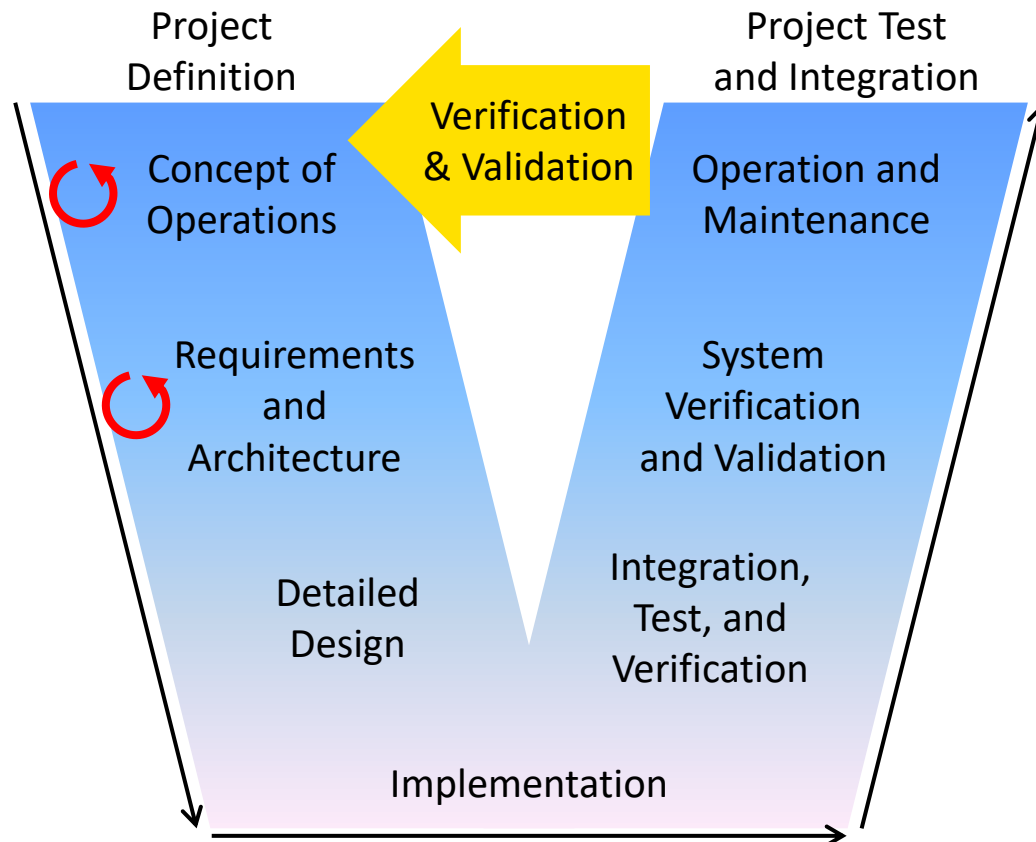
- Software cannot be missing in the hardware industry

# V Model

## ❑ Consider different design metrics

➤ Cost, number of gates, number of gate inputs, performance, etc.

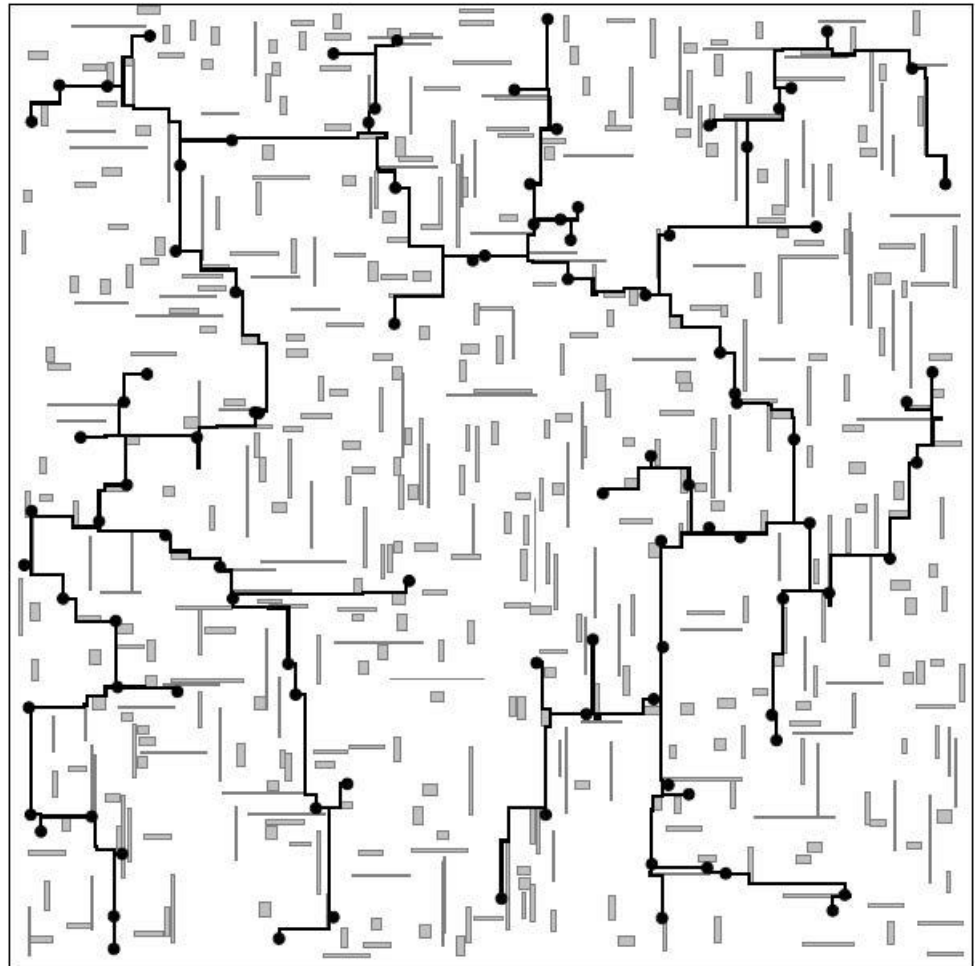
## ❑ Assist system designers for early design decisions



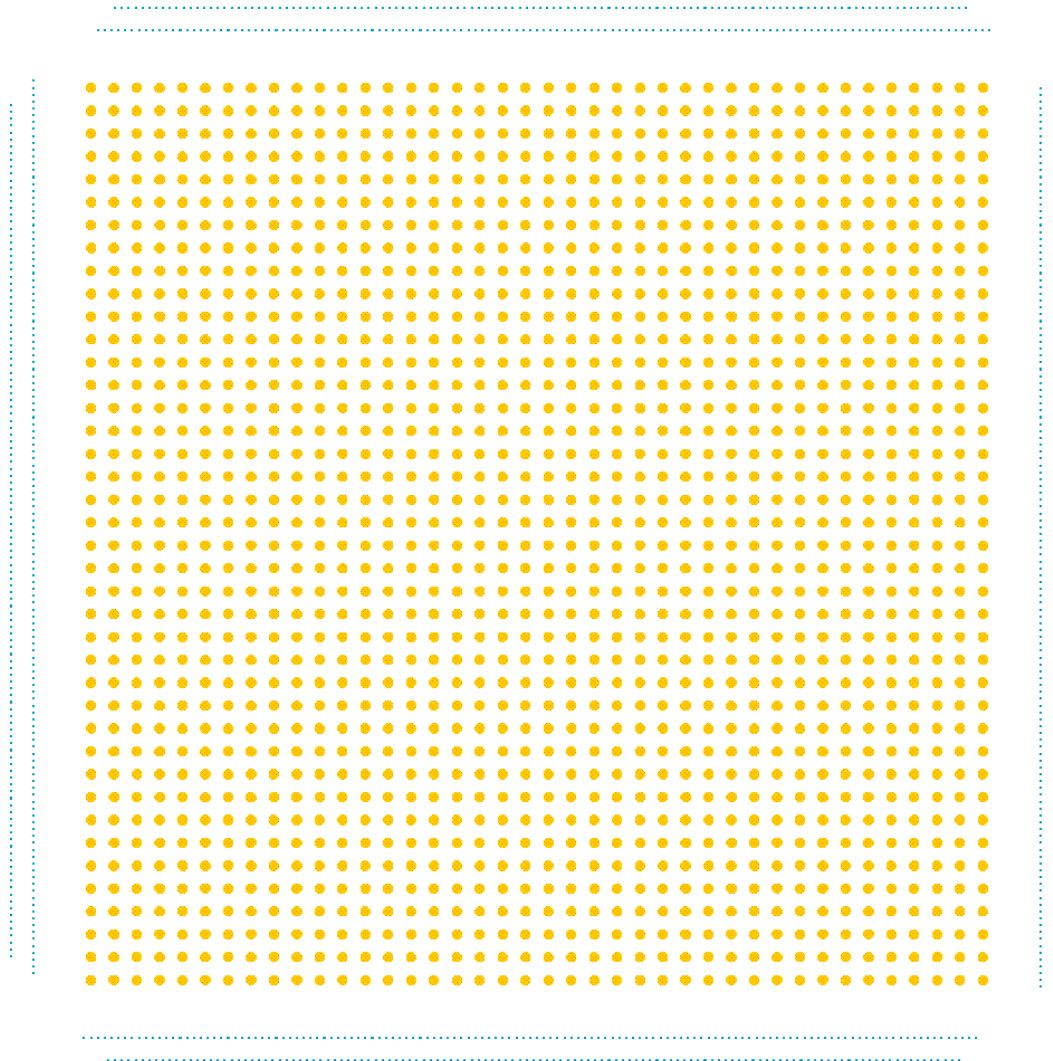
# Systematic Solutions (1/2)

## □ Examples

- Karnaugh map (from logic to gate circuits)
- Routing (between gates)



# Systematic Solutions (2/2)



# Electronic Design Automation

❑ [https://en.wikipedia.org/wiki/Electronic\\_design\\_automation](https://en.wikipedia.org/wiki/Electronic_design_automation)

## ❑ Design

- High-level synthesis, logic synthesis, physical design (placement and routing), and more

## ❑ Simulation

- Transistor simulation, logic simulation, and more

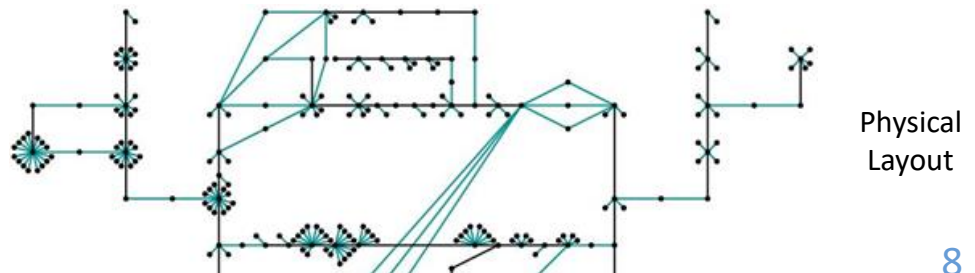
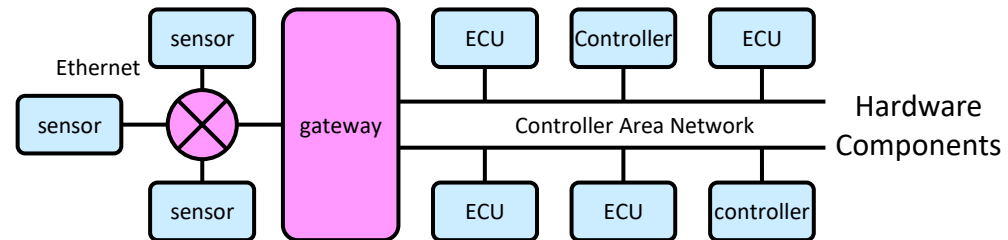
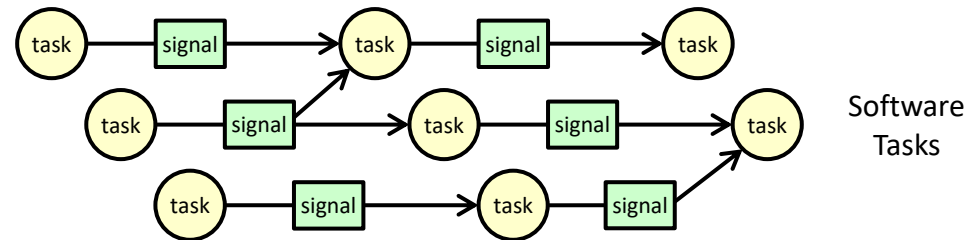
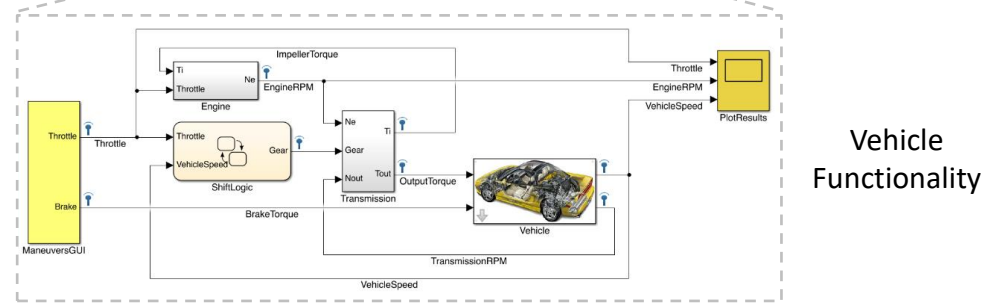
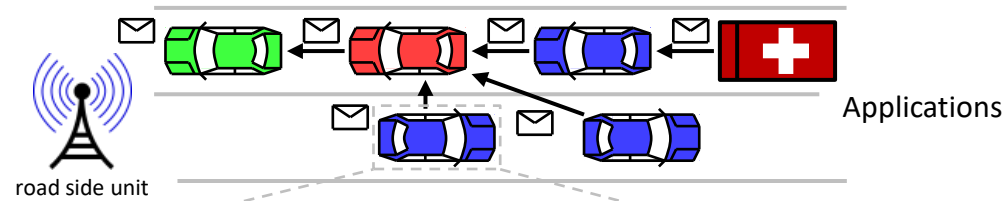
## ❑ Analysis and verification

- Formal verification (model checking), equivalence checking, static timing analysis, and more

## ❑ Manufacturing preparation

- Resolution enhancement techniques, optical proximity correction, and more

# Not Limited to Circuit Design

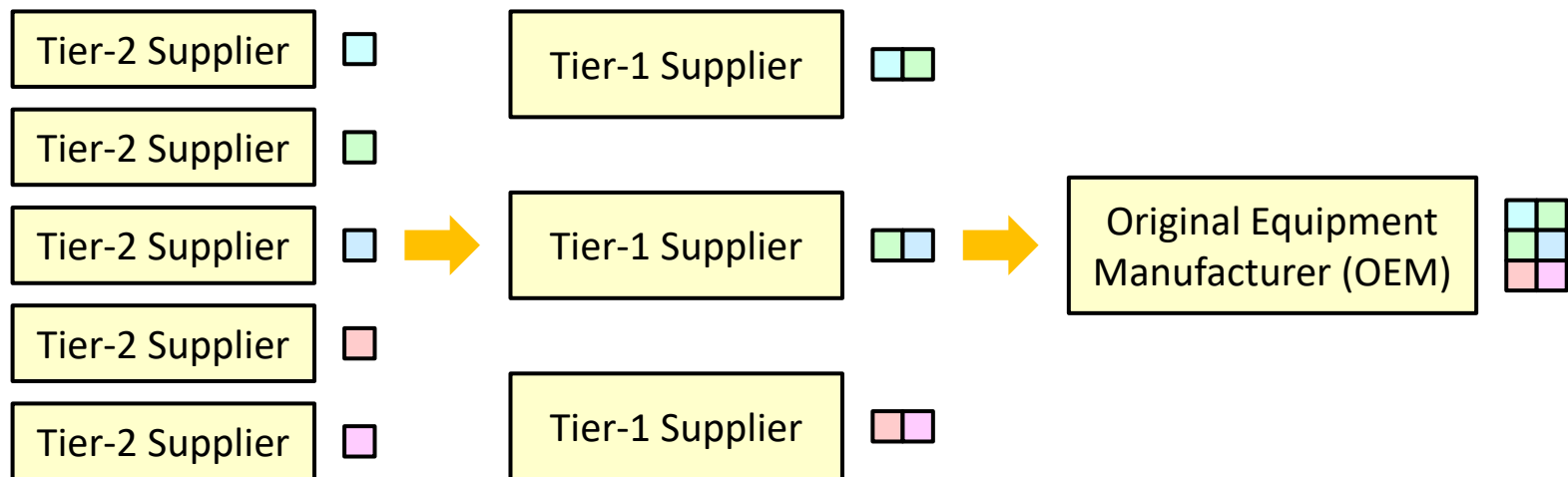




# Not Limited to Circuit Design



<https://www.amatechinc.com/resources/blog/tier-1-2-3-automotive-industry-supply-chain-explained>



# What's Next? (Last Slide)

- ❑ Week 14: supplementary material
- ❑ Week 15: DIS-14, DIS-15, and DIS-16
- ❑ Week 16: final exam
- ❑ Following coursework
  - [CSIE3340] Computer Architecture
  - [CSIE3110] Formal Languages and Automata Theory
  - Optional: [EE3020] Integrated Circuit Design
    - [More after that](#)
  - Optional: [EE3012] Introduction to Electronic Design Automation
    - [More after that](#)
- ❑ After graduation (two years from now?)
  - Industry, graduate program at NTU, graduate program abroad?

Thanks!  
&  
Final Exam on Jun 3!