Logic Design - CSE 314

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What is Logic Design?

- **What is design?**
  - ☐ Given a problem specification, come up with a way of solving.
  - ☐ This involve choosing appropriate components while meeting some criteria for size, cost, power, beauty, elegance, etc.
- **What is logic design?**
  - ☐ Determining the collection of digital logic components to perform a specified **control** and/or **data manipulation** and/or **communication** functions and the interconnections between them
  - ☐ Which logic components to choose? – there are many implementation technologies (e.g., off-the-shelf fixed-function components, programmable devices, transistors on a chip, etc.)
  - ☐ The design may need to be optimized and/or transformed to meet design constraints

Why study Logic Design?

- Obvious reason
  - This course is part of the Mechatronics and Electrical engineering program requirements

- More important reasons
  - It is the basis for all modern computing/control devices
  - It offers an interesting exposure of building large things from small components
  - First step in understanding hardware design and parallel computation

Application of logic design

- Conventional computer design
  - CPUs, busses, peripherals
- Networking and communications
  - phones, modems, routers
- Embedded products
  - in cars, toys, appliances, entertainment devices
- Scientific equipment
  - testing, sensing, reporting
- The world of computing is much much bigger than just PCs!

Course Objectives/contents

- **Objective: Design and implement digital circuits.**
- **Contents:**
  1. Binary numbers
  2. Boolean algebra and logic gates
  3. Gate level Minimization
  4. Combinational logic
  5. Synchronous sequential logic
  6. Registers and Counters
  7. Memory and Programmable logic
  8. Design at RTL (Register Transfer Level)
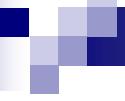
Course Objectives/contents

- How to specify/simulate our designs
  - hardware description languages
    - VHDL
    - Verilog

In this course, you will learn VHDL
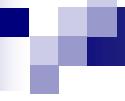
Course Material

- **Text Book:** Digital Design, 4th Edition, 2007, M. Morris Mano, Michael D. Ciletti, Prentice-Hall, Inc.

Course Assessment

- Total = 150 marks
- Term Work and Projects: 40
- Final Exam: 110