Final Exam

- When: 8:00-10:00 am Wednesday, May 13th
- Location: here

- 1/3: midterm material
  - See lecture notes for midterm preparation
- 2/3: material since midterm

- 1 page of personal notes
- No electronic devices/books/other notes
Final Preparation

• Exam discussion on D2L
  – Post sample questions (and answers)
  – Some may appear on the exam

• Look to homework assignments and exams from last year (both the midterm and final) for the types of questions
  – Note that class coverage in previous years has been different
Pre-Midterm Material

- Basic gates
- Boolean algebra
- Digital circuits and circuit reduction
- Number representations (binary, hex)
- Arithmetic: addition and shifting
- Bit-wise operators
- Sequential logic (flip-flops)
- Components of microprocessors
- Memory behavior (input/output signals, buses, addressing)
Key Microprocessor Components

- General- versus special-purpose registers
- Instruction decoder
- Data memory (RAM)
- Program memory (EEPROM in our case)
- I/O modules
  - Digital input/output
  - Serial UART
Special-Purpose Registers

What does each do?
• Program counter
• Instruction register
Timer/Counters

• Prescalars
• Counters (hardware)
  – Timer0, timer2: 8-bit
  – Timer1: 16-bit
• Interrupts on timerX overflow

• Computing timerX count frequencies/periods
• Computing timerX interrupt frequencies/periods
Interrupts

• What are they?
• Interrupt service routines. Examples:
  – Pulse Width Modulation (PWM)
  – Producing digital signals of various frequencies (e.g., can introduce software counters, too)
  – Sensor control (sonar)
Input/Output Systems

• Polling vs interrupt-driven input/output
• Modes of communication:
  – Parallel, serial, analog, PWM
Serial Communication

• What is it?
• How does it work?
  – Start/stop
• Software implementation
  – getchar(), putchar()
Finite State Machines

• Definition
  – States
  – Events
  – Transition function
  – Outputs and output function
• State transition diagrams
• FSMs for control
Basics of Digital Port I/O

- Input/output selection
- Output value
- Input
C Code

• Be prepared to read (and possibly fix) simple C code
• Look to lecture discussions of code and your projects as you prepare
Analog Processing

- Digital to analog:
  - Resistive network