06 - Midterm Review

CEG 4330/6330 - Microprocessor-Based Embedded Systems

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Midterm Format

- 10 Problems:
  - 2 Design Problems
    - 50% total
    - 25% each
    - 6.25 points each
  - 10 Concept Problems
    - 50% total
    - 5% each
    - 1.25 points each

Key Sections

- Introduction
  - Definitions + Examples
  - Memory Review
  - Square Wave

Note: these topics are only recommended for studying for the midterm, any material discussed in lecture or in slides may or may not appear on the midterm

Key Sections (cont.)

- Lab Introduction
  - Arduino basic functions and pin + I/O functions
  - Blink example
  - Analog read and analog write
  - Active high and active low
  - Bounce and debounce
  - LED circuit design

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Key Sections (cont.)

- Register Operation
  - Bitwise operations
  - DDRn, PORTn, PINn
  - Register manipulation for pins
  - Pull-up and pull-down resistors
  - Keypad scanning

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Key Sections (cont.)

- Timer manipulation
  - 8 bit vs 16 bit counter
  - Compare match, overflow, input capture
  - Register manipulation and control bits (WGM, CS, COM, OCnA/B, etc.)
  - Prescaler, frequency, counter, overflow calculations
  - PWM frequency and duty cycle
  - Input capture and conveyor belt example
  - Phase correct PWM, Fast PWM
  - OCnA and OCnB
  - Sample code

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Key Sections (cont.)

- Interrupt Programming
  - Polling
  - millis()
  - Interrupts
    - Interrupt service routine
    - How interrupts work
    - Use examples
    - Interrupt vector table and interrupt types
    - Maskable, non-maskable, globally enabled, locally enabled
    - Interrupt registers
    - Writing ISR
    - External interrupts
    - Realities of interrupts
- Analog to Digital Converter (ADC)

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Key Sections (cont.)

- Analog to Digital Converter (ADC)
  - Analog signals vs digital signals
  - Sampling
  - Quantization, error, mapping, 2-bit to n-bit quantization
  - Sampling frequency
  - FFT, Nyquist Rate, choosing sampling frequency
  - ADC design comparators vs successive approx.
  - Arduino ADC, sample code, interrupts, registers
  - Operational Amplifiers
    - Non-Inverting Amplifier, Inverting Amplifier, Inverting Amplifier With DC Offset
    - Design challenges

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