EECE 218
Microcontrollers
Introduction

Instructor: G. Karsai
Lab Instructor: A. Peters
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Course basics

- **Topic:** Design and operation of microcomputer systems, with focus on hardware, software, and systems issues.
- **Lectures:** MWF, 9-10AM, FGH129
- **Office hours:** MWF 10AM (notify in class)
- **Labs:** Per schedule, FGH 208
- [http://eecs.vanderbilt.edu/Courses/ee218/](http://eecs.vanderbilt.edu/Courses/ee218/)
Course basics

- Class pack: labs, additional data sheets, CPU Ref Guide
- Lectures:
  » Introduction to computers
  » Architecture and machine code programming of the microcontroller
  » Peripheral interfaces
  » Interfacing with interrupts
  » System issues
Course basics

- Labs:
  - 2 person groups, individual reports
  - Schedule
    - 1-3: Working with microcontrollers
    - 4-5: Machine code algorithms
    - 6-9: Interfacing
    - 10: Debugging
  - Lab practical: Blinky Project with microcontroller
Course basics

Schedule:

- First lab week: Jan 22
- Midterm #1: Feb 2
- Midterm #2: Mar 2
- Midterm #3: Apr 6
- Blinky projects begin: Apr 9
- All labs **DUE:** Apr 14
- Projects demos **DUE:** Apr 24
- Final: Apr 30, 2PM.
Course basics

● Grading:

Lecture:

• Quizzes: 10%
• Midterms (3): 3 * 20%
• Final: 30%

Labs

• Lab book: 80%
• Project performance: 20%

● Letter grade will be relative to performance of the entire class.

● Other details: See syllabus.
What is a microcontroller?

The ‘computer’ in all of these:
How it looks like:
Microcontrollers

- Continuation of digital logic – Why?
  - Hardwired logic is difficult/inflexible
    - Use programmable hardware instead
  - VLSI technology (>10^6 transistors on one chip)

- Microprocessor: a single-chip Central Processing Unit (CPU)

- Microcontroller: microprocessor + memory + peripheral interfaces on a single chip
Microcontrollers

- Families:
  - Intel: 4004 --- 8080 --- x86 ---- Pentium
  - Motorola: 6800 --- 680x0 --- PPC

- Ours: MC68HCS12DP256 (Motorola/Freescale)
  - A.k.a.: HCS12/9S12

- Design with micros:
  - hardware design:
    - relatively simple, ready building blocks
  - software design:
    - relatively complex, application driven
Computer architecture

- History of ‘mechanized computing’:
  - Babbage’s machine (mechanical calculator)
  - John von Neumann (Manhattan project, U Penn)

- 3 principles of von Neumann:
  - Use binary logic/numbers to represent everything
  - Use an electronic implementation
  - Store both
    - program (what is to be done)
    - data (what is to be manipulated)