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# EECE 218

## Microcontrollers

### Introduction

Instructor: G. Karsai  
Lab Instructor: A. Peters  
TA: Chris Costello

# Course basics

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- 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/>

# Course basics

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- Text: “The HCS12/9S12: An Introduction to Software & Hardware Interfacing” by Han-Way Huang (Thomson Delmar Learning).
- 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

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- 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

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- 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

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## ●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.

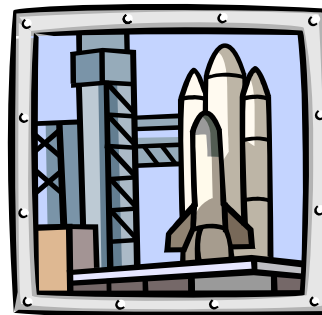
## ●Other details: See syllabus.

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# What is a microcontroller?

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The 'computer' in all of these:



# How it looks like:

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# Microcontrollers

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- 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

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- 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

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- 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)