

ARM Cortex-M Microcontrollers

Chapter 0 Course Introduction

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Course's objectives

- ▶ To understand the architecture of ARM Cortex-M family
- ▶ To master the interfacing between μC and other devices
- ▶ To acquire skills on programming & debugging these μCs
- ▶ To be familiar with simple applications of ES

Course's materials

- ▶ Required textbook:

Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C, First edition, Yifeng Zhu. E-Man Press LLC, 2015

- ▶ Referential course:

- ▶ Course accompanied by the required textbook:

- <http://web.eece.maine.edu/~zhu/book/>

Course's labs

- ▶ Referential labs:

<http://web.eece.maine.edu/~zhu/book/lab.php>

- ▶ Lab's kit:

STM Discovery kit with STM32L152RCT6

<http://www.st.com/web/en/catalog/tools/PF258515>

- ▶ 10 student groups

- ▶ Each group should prepare:

- ▶ USB type A to mini-B cable
- ▶ Laptop PC with Windows (XP, Vista, 7)

- ▶ 3 labs intended



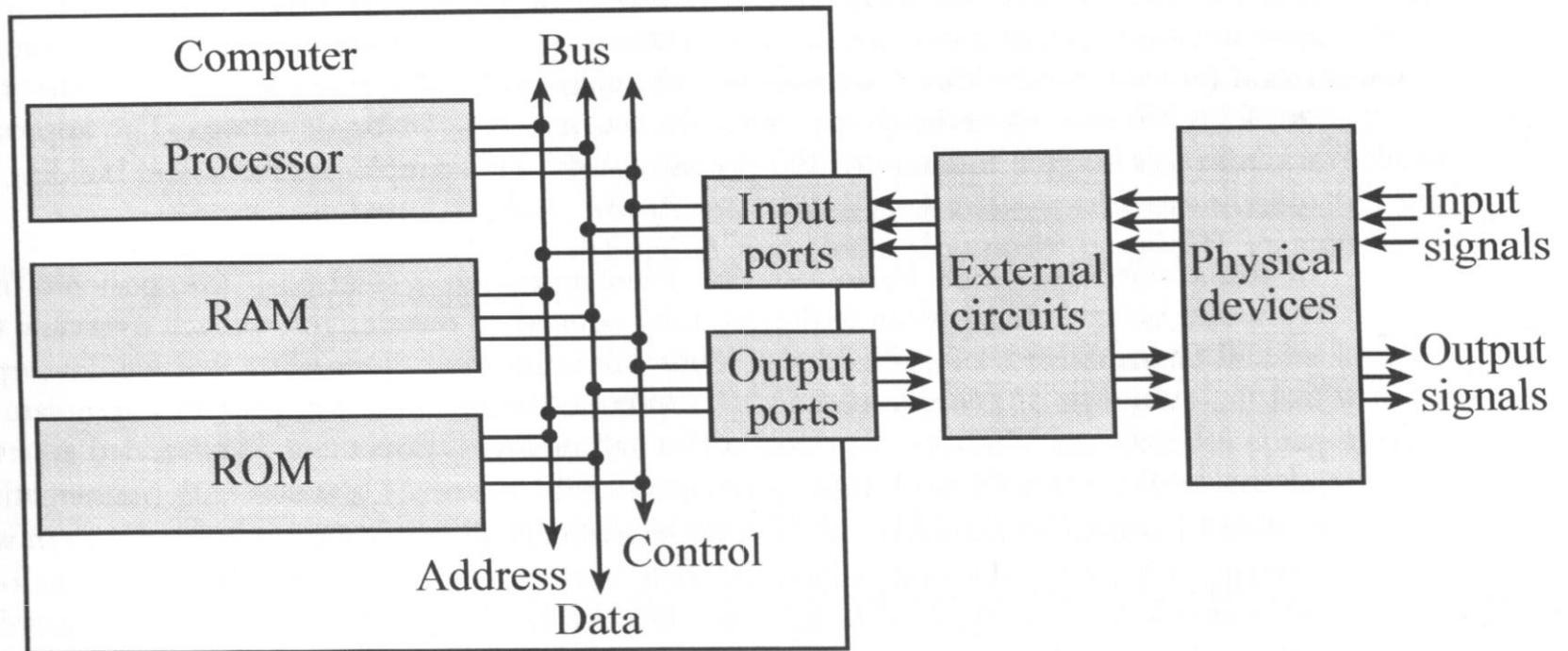
Grading

- ▶ Midterm: 20%
- ▶ Homework: 20%
- ▶ Final exam: 60%

All are paper-based tests

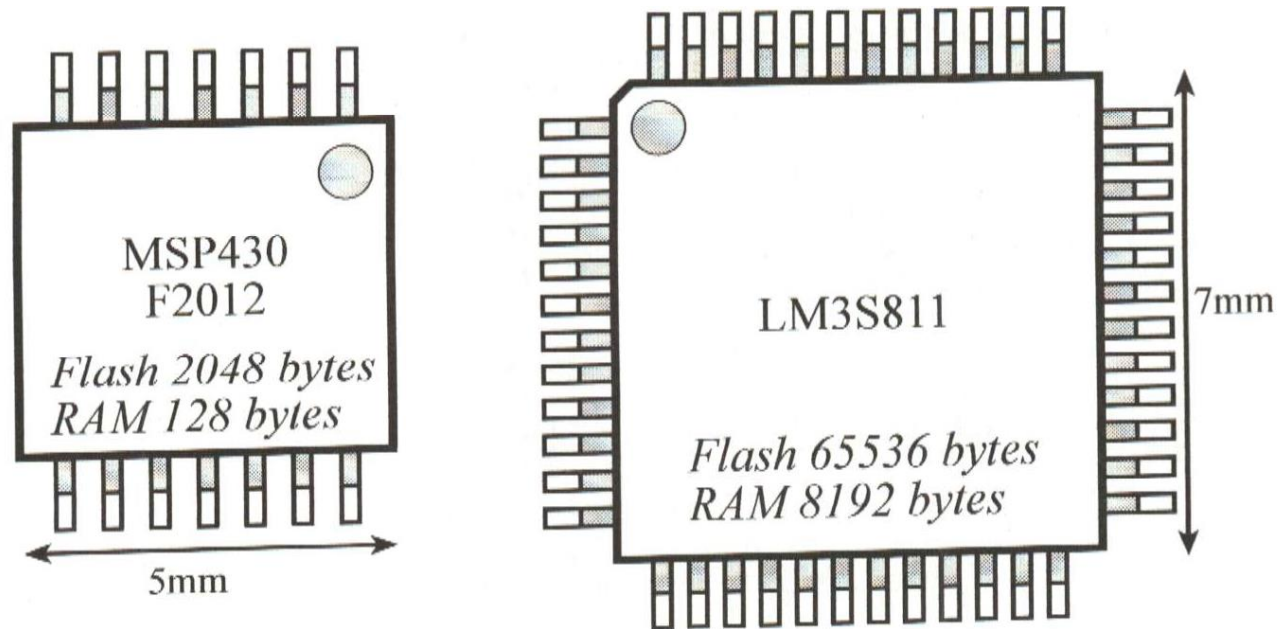
Computer

- ▶ A computer includes processor, memory, and I/O ports



Microcontroller

- ▶ A microcontroller (μC) is a complete computer on a chip

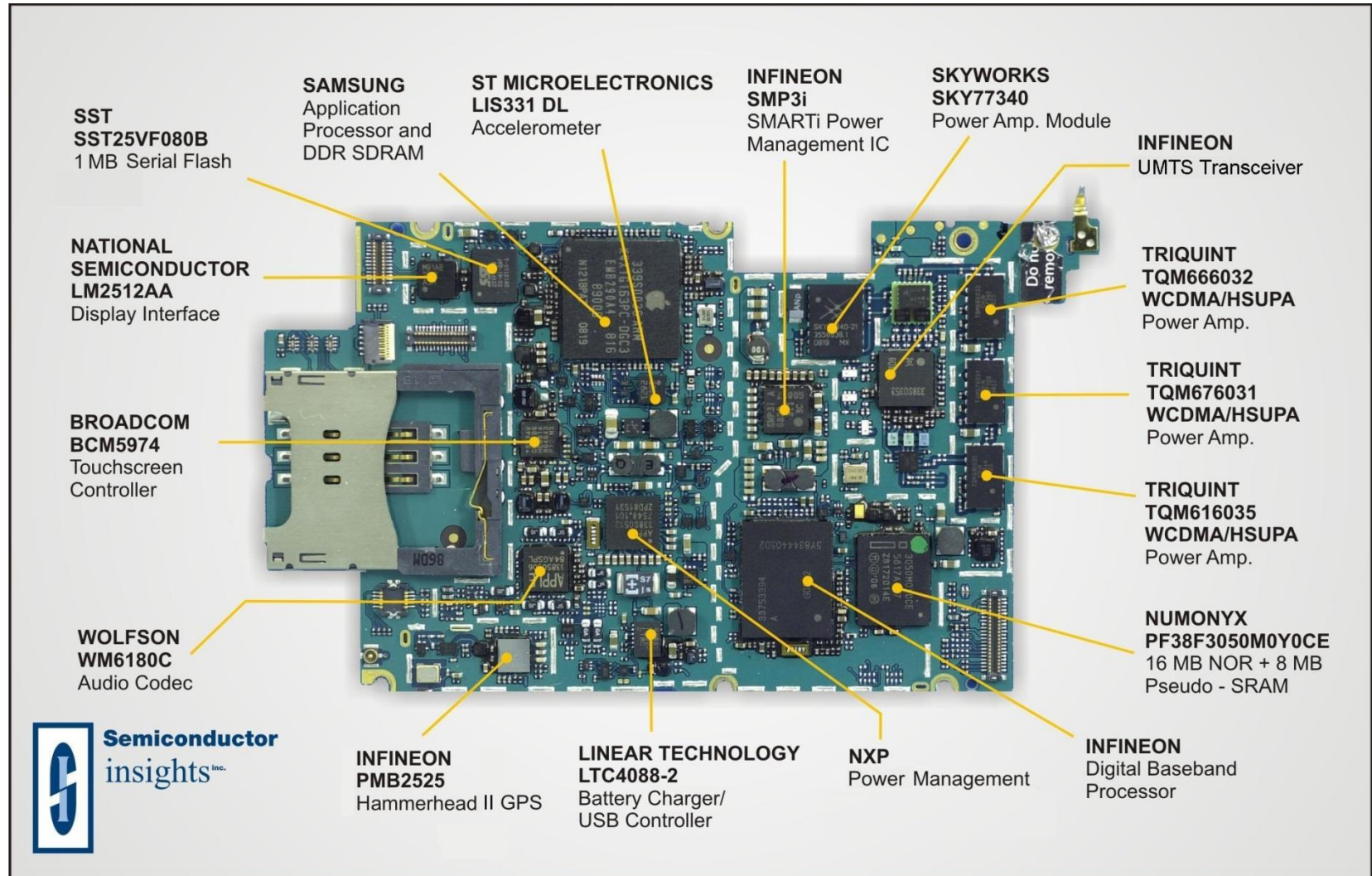


- ▶ RAMs are volatile, while ROMs are nonvolatile
 - ▶ Static RAM is much faster than Flash ROM, but information density is lower
- μC s have large Flash to store the software & smaller RAM to store temp. data

Embedded system (ES)

- ▶ An ES is an electronic system that includes one or more μ Cs configured to perform a specific dedicated application
 - ▶ “Embedded” means “a computer is hidden inside so one can’t see it”
 - ▶ “System” means that there are many components which act in concert achieving the common goal

Example of an embedded system: iPhone



General categories of embedded systems

- ▶ General Computing
 - ▶ Applications similar to desktop computing, but in an embedded package
 - ▶ Video games, set top boxes, wearable computers, automatic tellers
- ▶ Control Systems
 - ▶ Closed loop feedback control of real time system
 - ▶ Vehicle engines, chemical processes, nuclear power, flight control
- ▶ Signal Processing
 - ▶ Computations involving large data stream
 - ▶ Radar, Sonar, video compression
- ▶ Communication & Networking
 - ▶ Switching and information transmission
 - ▶ Telephone system, Internet