Introduction to Microprocessors

ECE 354 Computer Systems Lab II
Professor Russell Tessier
Department of Electrical and Computer Engineering
Spring 2002

Welcome to ECE354

- Laboratory-oriented course
- Learn embedded system design skills
  - software development and hardware debug
- 4 labs based on 16F877 microprocessor
  - 5 total labs
- Each lab requires a demo and final report
- Students work in groups of 2

Overview

- Course overview
- Computer systems structure
- Generic CPU, memory, I/O
- Specific microprocessor features/details
- Lab equipment demo

Your Destiny

- Microchip 16F877
- 8 bit external interface
- 32 bit internal registers
- Basis for many embedded applications

Important Lab Information

- Each lab assignment counts the same
- TAs will supervise lab
- No FOOD or DRINK in lab
- Required textbook
  - Design with PIC Microcontrollers by John Peatman
- Additional lab staffing as needed

Lab Assignments

- Lab 1: Terminal input/output
- Lab 2: External bus control
- Lab 3: External interface to memory
- Lab 4: Analog data transfer
- Lab 5: Programming a DSP

Grading

- Lab assignments – 80%
- Midterm – 20%

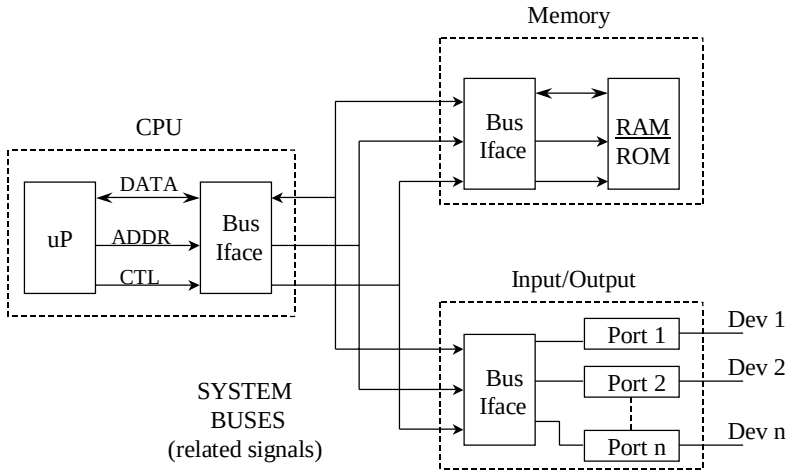
Quizzes will be designed to test understanding of the labs.

Lab assignment grade (35% checkoff, 65% report)

Microprocessor Usage

- General purpose computer
  - runs user programs
  - optimized for large class of applications
  - modular, expandable
- Embedded computer
  - enclosed within larger system
  - dedicated function
  - small, highly-optimized

Basic Computer System



Processor Signal Groups

- Address and Data
  - – together they form a bus
- Bus Control
  - – synchronizes data transfer between processor and peripherals
- Interrupt
  - – allows peripherals to request service
- Bus Arbitration
  - – determines when peripherals access the bus

16F877 Microcontroller

- Complete, highly-integrated microcomputer
  - CPU, RAM, ROM, IO
- Port 0
  - 8-bit bidirectional I/O port OR
  - multiplexed low-order address and data bus bytes
- Port 1
  - 8-bit bidirectional I/O port
- Port 2
  - 8-bit bidirectional I/O port OR
  - high-order address byte
- Port 3
  - 8-bit bidirectional I/O port

Summary

- Microprocessors are “brains” of most computers
- Hardware knowledge helps programming
- Standard interfaces simplifies hardware design
- Current trend toward system-on-a-chip (SOC)
- Your task: interface processor to memory and terminal

Things To Do

- Laboratory demo
  - logic analyzer
  - PLD programmer
  - oscilloscope
- Fill out signup sheet
- Get Peatman book – skim Chapter 1
- Do introductory exercise