COMP3221: Microprocessors and Embedded Systems

Lecture 1: Introduction
http://www.cse.unsw.edu.au/~cs3221
Lecturer: Hui Wu
Session 1, 2005

COMP 3221 Administration (1/2)

Lecturer:
Hui Wu: huiw@cse.unsw.edu.au
Office: K17-501D
Consultation: Friday 2:00–5:00pm

Lecturer In Charge of the Lab:
Samir Omar: omar@cse.unsw.edu.au
Office: K17-314A
For all issues regarding the lab contact Samir

Course Homepage:
http://www.cse.unsw.edu.au/~cs3221

Course homepage contains:
• All Lecture slides presented in the class.
• All documentation related to the Laboratory Exercises.
• Pointer to supplementary material.
• Announcements.
Check it out frequently!

Syllabus (1/2)

Main Topics:
• Instruction Set Architecture (ISA).
• Number representation, computer arithmetic.
• Assembly and machine language Programming.
• Interrupts and I/O interfacing.
• Serial communication.
• Analog Input and output.
• Buses and memory system.

COMP3221 Administration (2/2)
Laboratory exercises:
- AVR assembly programming and I/O interfacing.
  Tools include AVR Studio, AVR board designed by David Johnson.

Assignment:
- A survey of ARM microprocessor.
- A lift controller using AVR.

Digital Circuits (ELEC 1041, COMP 2021)
- Number representation, coding, registers, state machines.
- Realisation of simple logic circuits.
- Integrated circuit technologies.
- Designing with MSI components.
- Flip-Flops & state machines.
- Counters and sequential MSI components.
- Register transfer logic.
- Bus systems.

Computers and Computing (COMP1011 & COMP1021)
- The von Neumann model: memory/I-O/processing.
- The instruction set and execution cycle.
- Registers and address spaces.
- An instruction set: operations and addressing modes.
- An expanded model of a computer: mass storage and I/O.
- The layered model of a computer: from gate- to user-level.
- C- Language Programming.

Main references for lecture material
- Fredrick M. Cady: Microcontrollers and Microcomputers — Principles of Software and Hardware Engineering.

Additional references
Laboratory Schedule

• Tuesday: 13:00 – 15:00 EE233
  18:00 – 20:00 EE233
• Wednesday: 9:00 – 11:00 EE233
• Friday: 18:00 – 20:00 EE233
• You will be only allowed to attend the lab session that you
  are enrolled in. No exception allowed.
• Starts in week #3.

Special Open Access labs
• TBA
• Not assessed.
• It is only for those who need a bit of extra time.

Enrolment System in Lab Session

• Run “sirius” booking system form any CSE lab machine.
• Read http://www.cse.unsw.edu.au/%7Ehelpdesk/documentation/SiriusGuideNew.ps as how to run “sirius”.
• Any problem with “sirius”, contact Mei-Cheng Whale (meicheng@cse).
• If you want to work with a partner please make sure that
  both of you enrol for the same lab session.
• You will be paired with a partner randomly if you don’t
  have one.

  Students who DO NOT select their Lab sessions will be not be allowed into the lab.

Lab Format

° In group of two partners.
° You choose your partner in Sign Up Session (Week #3).
  It CANNOT be changed later.
° You will get a group account.
° No formal report to hand in.
° You are assessed based on a system of checkpoints.
° Assessors mark you check points.
° Lab Demonstrators help you with the lab.

Laboratory Preparation & Catch Up

° You CAN finish the laboratory exercises in the allocated time
  only if you do the preparation before hand.
° You need to prepare for the laboratory outside the laboratory
  by:
  • Carefully reading the lab related documentation
  • Writing your program and simulating them at home
° Leaving things to the last minute or walking into the laboratory
  without preparation may make you fail in this course.
° Go to one of the OPEN ACCESS Sessions if you think you are
  falling behind.
**Laboratory Structure & Specifications**

- 5 experiments.
- Each experiment lasts two weeks.
- Lab specifications are available in the course homepage one week before each experiment starts.

**Assignments**

- Two assignments.
- The first assignment: A Survey of ARM Microprocessor.
- The second assignment: An AVR-Based Lift Controller.
- Details to be announced.

**Course Grading Scheme**

- Laboratory mark = 25%
- Assignment mark = 25%
  - Assignment 1: 10%
  - Assignment 2: 15%
- Final exam mark = 50%
  - Postgraduate students have a different exam paper (not harder, but slightly different scopes).

**Why Take This Course?**

- Embedded Systems is a big, fast growing industry (US$ 40 billions in 2000).
- Microprocessors/Microcontrollers are the core of embedded systems.
**What is an Embedded System?**

- A combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a dedicated function. In some cases, embedded systems are part of a larger system or product, as is the case of an anti-lock braking system in a car. Contrast with general-purpose computer.
- Examples range from washing machines, cellular phones to missiles and space shuttles.

**Why AVR?**

- RISC architecture with load-store memory access.
- Two-stage instruction pipelining.
- Internal program and data memory
- Wide variety of on-chip peripherals (digital I/O, ADC, EEPROM, UART, pulse width modulator (PWM) etc).

**Microcontrollers vs Microprocessors**

- A microprocessor is a CPU on a single chip.
- If a microprocessor, its associated support circuitry, memory and peripheral I/O components are implemented on a single chip, it is a microcontroller.