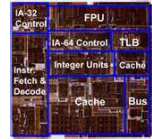




The University of Missouri - Columbia
Electrical & Computer Engineering Department
ECE3210 Microprocessor Engineering and
ECE4270 Microcomputer Architecture and Interfacing



Electrical and Computer Engineering 3210/4270
Microprocessor Engineering
and
Microcomputer Architecture and Interfacing

Prerequisite:

For ECE 3210: ECE 1210 Intro to Logic Systems

**For ECE 4270: old ECE2210 Introduction to Digital Computing
and old ECE3210 Logic Design**

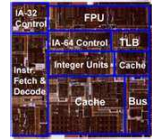
G. DeSouza

January 2011

University of Missouri - Columbia
Electrical & Computer Engineering Department
Columbia, MO 65211



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Description: This course compares the architectures of 16 and 32 bit microprocessors. While the Intel and Motorola families will be emphasized because of their dissimilarities and representative designs, other manufacturers and other architectures (e.g. microcontrollers, RISC, and DSP) will be discussed where appropriate. The course will examine bus timing as well as memory and I/O interfaces associated with these families. In order to familiarize the designer with the operational aspects of systems based on these processors, the course will involve extensive use of assembly language programming so that system architecture and interface performance can be gauged

Instructor: Prof. Guilherme N. DeSouza

Lab TA: Omran Chaudhry

Course Texts:

The INTEL Microprocessors – 8086/8088, 80186/80188, 80286, 80386, 80486, PENTIUM, PENTIUM PRO Processor, PENTIUM II, PENTIUM III, PENTIUM 4 Architecture, Programming and Interfacing. Barry B. Brey, Eighth Edition, Prentice Hall

References: Using Assembly Language, Allen L. Wyatt, Sr., 3rd edition, QUE, 1992.

G. DeSouza's Office Hours: By appointment - EBW 325

E-Mail: desouzag@missouri.edu

O. Chaudhry's Office Hours: To be announced – EBW 137/139

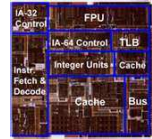
E-Mail: oschaudhry@mail.mizzou.edu

Course Format: Lectures will occur on Mondays, Wednesdays and Fridays, and laboratory meetings will be on Tuesdays or Thursdays (to be determined during the first week). There will be a total of two exams: one mid-term and one final exam. Lab work is scheduled for two hours per week. Lab teams **MUST** be made of the same “class” of students. That is, grad students can only team up with other grad students. Also, grad students will be required to propose projects that will be presented in the middle of the semester and at the end of the semester. Homework assignments will be handed out and collected, but they won't be marked and grades will be based simply on problem completion.

Lecture Notes and Assignments: Lecture notes will NOT be made available: students should take their own notes. Lab and Homework assignments will be made available in advance on the web at <http://www.missouri.edu/~desouzag/>

Course Topics:

1. An overview of Microcomputer Architectures
2. The Intel 80x86 Family Architecture
3. Modular Programming & Program Development
4. Assembly Language Extensions
5. Memory Management, Paging and Protection
6. Bus Structures and Timing Considerations
7. Memory and Cache
8. Interrupt Control
9. I/O Interfaces and DMA with VHDL
10. Numeric Processor and Floating point



Labs:

1. Assembly language program development environment.
2. Program development with arithmetic computation. with .COM and .EXE files
3. Data sorting with keyboard entry and data import with a data macro
4. Searching, Adding and Deleting records from a data structures with file I/O.
5. High level /low level language interfaces to assembly language. (C)
6. Software Hardware Tradeoffs – CISC v. VHDL based FPGA peripheral

ABET Course Learning Objectives:

1. Develop assembly language programs that demonstrate an understanding of processor architecture and program development environment.
2. Demonstrate an understanding of memory management, the protected mode and the virtual 8086 mode employed in the lab.
3. Given overall specifications, design memory from typical memory components such as SRAM, DRAM, EPROM and FLASH.
4. Design Cache Memory from SRAM elements for direct mapped and n-way set associative organizations.
5. Analyze an implanted system to determine base address, range of memory and I/O and the number of reflections resulting from partially decoded address lines.
6. Evaluate Software Hardware Tradeoffs – CISC code vs. VHDL FPGA

Cheating: Cheating is **strictly prohibited**. Anyone caught cheating will face the appropriate penalties established by the University, including the possibility of being expelled. Cheating violates any concept of honesty, integrity, and engineering ethics and it will eventually hurt your selves more than you think. So, while team work is strongly encouraged, be honest when you take tests and complete your projects.

Grade Construction

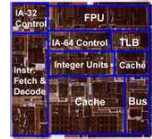
GRADE COMPONENT	POINTS: ECE4270	POINTS: ECE7210
Exams	100 (midterm) & 150 (final)	same
Projects	N/A	100
Homework	50	50
Laboratory Grade:	100	100
Total Points	400	500

Team work: The laboratory projects are assigned to a lab team (two people per team). Team work and planning are an important part of the engineering profession. Therefore, dividing the problem into parts and assigning parts to team members is not only proper, but advised. However, each member of the team is responsible for understanding **everything** about the laboratory project.

Statement on Academic Honesty: Academic honesty is fundamental to the activities and principles of a university. All members of the academic community must be confident that each person's work has been responsibly and honorably acquired, developed, and presented. Any effort to gain an advantage not given to all students is dishonest whether or not the effort is



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successful. The academic community regards academic dishonesty as an extremely serious matter, with serious consequences that range from probation to expulsion. When in doubt about plagiarism, paraphrasing, quoting, or collaboration, consult the course instructor.

Statement on ADA: If you have special needs as addressed by the Americans with Disabilities Act (ADA) and need assistance, please notify the Office of Disability Services, A048 Brady Commons, 882-4696 or course instructor immediately. Reasonable efforts will be made to accommodate your special needs.

ECE4270/ECE7210 LABORATORY RULES & GRADING

GROUP ORGANIZATION:

1. There are two students in a group. Each group performs the following tasks:
 - a) Prelab report
 - b) Programming
 - c) Postlab report.
2. Each group should work independently and should NOT give their programs to others. Both students in the group are responsible for the assignment. Any violation will lead to penalty.
3. After the first week of lab, you cannot change your group.

TASKS:

1. Prelab Report:

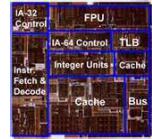
- a) Write pseudo code or a flow chart for the program. Pseudo code should be structured and descriptive rather than technical.
- b) Other specific works assigned in the lab handout.
- c) The pseudo code or the flow chart must be turned in at the beginning of the lab period.
- d) The report must be typed.

2. Lab Work:

- a) Your T.A. will check your program during the lab period.
- b) If the program works completely following the program requirements, you will earn 50 points.
- c) Partial credits will be earned upon the work progress.



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3. Postlab Report:

- a) Due by next lab period.
- b) Lab report format:
 - i. Objective
 - ii. Program (.lst file and .asm file)
 - iii. Conclusion.
- c) Report must be clear and neat. Program must be structured and commented adequately. The conclusions should contain what the overall experiment taught you, specific concepts learned from the lab and, if the lab did not work, why.
- d) The report must be submitted using Blackboard. The .asm and .lst file must be included separately from the report, which may be in MS Word, or pdf format. No late reports will be accepted.

GRADING:

1. Each experiment is worth 100 points including LAB 1.

2. Experiments are graded as follows:

- a) Prelab 10 points
- b) Program 50 points
- c) Postlab 40 points (No credit for late report)

i. For the lab work (Program):

50 points, if completed during the lab period
30 points, if completed before the next lab period
No credit for labs which work after the next lab period.

ii. Postlab report grading guide lines:

Objective 5 points
Program 20 points
Conclusion 15 points.

iii. There may be lab quizzes during the semester to check team participation.

COMPUTER FACILITY:

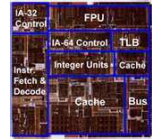
The lab will be held in 352 EBW. The combination to the door will be given in class. You will need a floppy disk in order to work in the lab.

LAB REGULATIONS:

1. No food or drink in the lab.
2. Do not give lab combination to others.
3. Do not leave your own software or programs on the computers in the lab.
4. Do not put backpacks etc. on the computer desktop as dust damages the mice and floppy drives.



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Spring 2011

	Lab1	Lab2	Lab3	Lab4	Lab5	Lab6	Lab7	Lab8
Week 1								
Week 2								
Week 3	Prelab							
Week 4	Program	Prelab						
Week 5	Postlab	Program	Prelab					
Week 6		Postlab	Program	Prelab				
Week 7			Postlab	Program				
Week 8				Program	Prelab			
Week 9	Mid-Term – Mar 16th			Postlab	Program			
Week 10					Program	Prelab		
Spring Break								
Week 12					Postlab	Program		
Week 13						Program	Prelab	
Week 14						Postlab	Program	Prelab
Week 15							Postlab	Program
Week 16								Postlab
FINAL EXAM: TBA								