CSCE 513 Computer Architecture
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Syllabus Highlights

• Dr. Cameron’s info
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  - TR 3:15-4:30 or by appt.
  - Phone: 777-8627

• TA: Allen Michalski
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  - 1D49
  - TR 12:30-1:45pm
  - Phone: 576-6355

• Text:
  - Computer Organization and Design: The Hardware/Software Interface by Patterson and Hennessy (2nd Edition)

• Exams:
  - midterm and a comprehensive final exam
  - Closed book, crib sheets (later)

• Grading:
  - 25% midterm, 35% final exam
  - 35% projects, 5% participation

• Homework (exam-like questions, not collected, not graded, hard-copy solutions posted)

• Supplementary readings (papers, appendices, background)

Syllabus Highlights

• Projects: (subject to change)
  - Microbenchmarking
  - Application Speedup
  - Simulation
    - Undergrad
      - Introductory simulation project
    - Grad students
      - Advanced simulation project

• Undergrads
  - Introductory simulation project
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• Pop Quizzes
  - Extra credit only, 5 minutes only, 2:00 pm by my watch
  - Analytical puzzles, not course material
  - Goals:
    - Encourage promptness
    - Reward thinking outside the box
    - Points will be tacked onto final exam grade (not final grade!)
    - Each quiz worth 1 point. ½ point for attempt, ½ if correct
    - No makeup, if late then no quiz for you (late is when I say it is)

Academic Dishonesty

• You are responsible for your conduct
• Unless otherwise specified you must do your own work on all assignments and exams.
• Those found cheating will be referred to the university committee on academic dishonesty and will receive an F in this class.
• If you are unsure as to what constitutes cheating see web page, ask instructor
**Academic Courtesy**

- No chatting among classmates during lecture
  - Distracts me and impolite to others
- No food in class, drinks are o.k. - but be careful
- No web surfing during class
- I welcome questions provided:
  - You are respectful of others (raise hand, don’t interrupt classmates, be polite)

**Prerequisites**

- MATH 141 Calc I C or better
- MATH 115 Pre-calc
- MATH 174 Discrete Math
- CSCE 145 Algorithm Design I
- CSCE 211 Digital Logic
- CSCE 213 Computer Organization
- CSCE 212 Intro to Comp Arch
- CSCE 513 Computer Architecture
  - or
- or

**Things you should already know…**

- Binary arithmetic
- Number representation
  - 2’s complement (int and fp)
- Combinational logic
  - And, or, xor, nand, nor, mux, etc
- Sequential logic
  - Flip-flops

**Things you should already know…**

- Basic design
  - Adders, 1-bit ALUs, PLAs, DRAM, register files
  - Control, basic organization
- Some assembly language
- Memory addressing (virtual vs. physical mapping)
- Boolean algebra
  - Axioms, laws, theorems, reduction (Karnaugh maps)

See recommended text for help on these topics…
Computer Organization and Design by Patterson and Hennessey

**Things you should learn…**

- Memory organization
- Performance quantification and issues
- ILP
- Simulation
- Into to Advanced Architecture Topics

**Why you should take this class…**

- You want to learn something…practical
- You want to do something…practical
Things you will do...

- System benchmarking
- Improving application performance
- Microarchitecture simulation

Why not to take this class...

- Need to fill my schedule
- Need to graduate this semester
- Need an easy grade
  - Fall 2003: 34 students
  - Grads: 4 A, 2 B+, 8 B, 3 C, 1 D, 4 F
  - Ugrads: 2 B+, 1 B, 4 C+, 3 C, 2D
  - Grades are earned, not given

Questions?

Intel 8080, 1975 4500 transistors


Intel 8086, 1978 29000 transistors

Intel 286, 1982 90000 transistors
**Gordon Moore’s Law**

The number of transistors that can be fabricated on a single integrated circuit at a reasonable cost doubles every year...

- **How?**
  - Material techniques such as extreme ultraviolet lithography (<100 nm)

- **Impact:**
  - Increase in manufacturing yield, more dies per wafer
  - Smaller transistors consume less power => Higher speed for same power per unit area
  - More complex devices can be created in same die area

- **Corollary**
  - Processor speed doubles at same rate

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**What do we do with all these extra transistors?**

- Computer Architecture studies how to
  - Define important attributes of new machine
  - Optimize design for attributes
  - ISA organization
  - Logic, packaging, power, cooling
  - Price verse performance
- This text: Inductive reasoning