Computer Systems  CEN591(502)
Fall 2012

Sandeep K. S. Gupta
Arizona State University
Agenda

- Introductions
- Syllabus
- Survey
- Class registration issues
Computer System?

- Underlying principles for hardware, software, and networking:
  - Computer Architecture + Compiler + OS + Application

The necessary background for graduate students to pursue advanced study in the areas of computer engineering.
Course goals and topics

- To understand fundamentals of computer systems
  - Introduction
    - Technology trends in computer systems
    - Primers on computer architecture
    - Primers on computer system design
    - Fundamentals of quantitative design and analysis of computer systems
  - Computer architecture
    - Memory hierarchy
    - Memory protection and virtual machine memory protection
    - Instruction-Level Parallelism
    - Data level parallelism
    - GPU architecture
    - Thread-level parallelism and multi-core processors performance
  - Machine level representation of programs and data
    - Representing and manipulating information
    - Machine level representation of programs
Course goals and topics—cont’d

- To understand fundamentals of computer systems
  - Operating system
    - Processes and Interrupt handling
    - Process synchronization
    - Virtual memory
    - System I/O
  - System software
    - Compilers
    - Linkers, and loaders
  - Networking:
    - MAC layer, TCP/IP, network programming
  - Emerging computing paradigms:
    - Warehouse-scale computers, data centers
    - Cloud computing
- To learn the efficient way of programming
  - Data types, Security in coding, Computer Arithmetic
  - Memory and I/O Matters
  - Codes performance
COURSE MECHANICS and policies
Reference books

- Computer Systems: A Programmer's Perspective 2ed, Randal E. Bryant and David R. O'Hallaron
- Computer Architecture: A quantitative approach, John L. Hennessy and David A Patterson.
- Operating Systems Concepts, Silberschatz et al.
- Compilers, Principles, Techniques, and Tools, Aho et al.
- Fundamentals of Mobile and Pervasive Computing, Adelstein et al.
Course Mechanics

- Homework and Programming Assignments (one every two to three weeks): 20%
- Reading assignments and Quizzes (every week): 10%
- Midterm and Final Exam: 70%
  - Two midterms (tentative dates): W Oct 10th and W Nov 7th.
  - Final exam: F Dec 14th 9:50 to 11:40am.
A Note about “RAQ” Hazard

- RAQ = “Read After Quiz”
- Quizzes can be unannounced
- Meant to make sure you are in SYNC with the class
- Reduce some pressure from Exam preparation
- Read the material (book, slides, paper etc.) before coming to class and/or view assigned pre-recorded lecture.
“No Distraction” Policy

- No Laptops/Netbooks/Cell Phone/News Papers etc.

- Laptops/Netbooks may be permitted – only with instructor’s permission
  - Only for note-taking purpose (all other activities disallowed unless instructed).
Cheating/Plagiarism Policy

- Strictly prohibited
- See University policy
- Minimum punishment – zero in the assignment
Class Format

- Quiz (10 min)
- Quiz review + Recap (5 min)
- Lecture (45 to 55 (when no Q) min)
  - (If used) Slides will be posted after the class
- Discussion (10)
  - Take Notes!
- Assignment Qs/Next Class (5 min)
  - Take Notes!
Class Cyberpresence

  - slides
- Blackboard
  - Class assignments
  - Solutions
  - Discussion board
  - Reference material
- Visit regularly for latest information
What can you expect from this course?

- Lots of in-class interaction
- Interesting and challenging assignments and exam questions
- Help/Tutorials by instructor/TA on difficult material
- And lot more!
Contacting Me or TA

Instructor
- Email: sandeep.gupta@asu.edu
  - Subject line: CEN591Fa11
- Office: BY 522
- Phone: 5-3806
- Office Hours: MW 3-4:30 pm
- Call me | | come to my office hrs | | Set up an appointment
- http://impact.asu.edu

TA: Zahra Abbasi
- Email: zahra.abbasi@asu.edu
- Office BY517
- Office Hours: MTTh 11-12 or by appointment
What do I do when I am not teaching?
### IMPACT: Research

**Use-inspired** research in pervasive computing & wireless sensor networking

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<tr>
<th>ID Assurance</th>
<th>Mobile Ad-hoc Networks</th>
<th>Pervasive Health Monitoring</th>
<th>Criticality Aware-Systems</th>
<th>Thermal Management for Data Centers</th>
<th>Intelligent Container</th>
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<tr>
<td><strong>Goal:</strong> Protect people’s identity &amp; consumer computing from viral threats</td>
<td><strong>Goal:</strong> Protocols for mobile ad-hoc networks</td>
<td><strong>Goal:</strong> Pervasive Health monitoring</td>
<td><strong>Goal:</strong> Evaluation of crisis response management</td>
<td><strong>Goal:</strong> Increasing computing capacity for datacenters</td>
<td><strong>Goal:</strong> Container Monitoring for Homeland Security</td>
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<td><strong>Features:</strong> • PKI based • Non-tamperable, non-programmable personal authenticator • Hardware and VM based trust management</td>
<td><strong>Features:</strong> • Energy efficiency • Increased lifetime • Data aggregation • Localization • Caching • Multicasting</td>
<td><strong>Features:</strong> • Secure, Dependable and Reliable data collection, storage and communication</td>
<td><strong>Features:</strong> • Theoretical model • Performance evaluation • Access control for crisis management</td>
<td><strong>Features:</strong> • Online thermal evaluation • Thermal Aware Scheduling</td>
<td><strong>Features:</strong> • Integration of RFID and environmental sensors • Energy management • Communication security</td>
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<td><strong>Sponsor:</strong> [ID Assurance Logo]</td>
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**Medical Devices, Mobile Pervasive Embedded Sensor Networks**

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What’s Next?

- Next Class: Technology trends in computer systems
  - Computer Architecture: A quantitative approach, John L. Hennessy and David A Patterson, 5th ed. Ch 1, Sec 1-6

- Plan for next few lectures: Intro to Computer Arch., primers on computer system and organization, and quantitative analysis of computer systems
  - Computer Architecture: A quantitative approach, John L. Hennessy and David A Patterson, 5th ed. Ch 1, Sec 3
  - Computer Systems: A Programmer's Perspective 2ed, Randal E. Bryant and David R. O'Hallaron, 2nd ed, Ch 3, Sec 1