15-213
Fall 2007

Introduction to Computer Systems

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Topics:

- **Staff, text, and policies**
- **Lecture topics and assignments**
- **Lab rationale and infrastructure**

Teaching staff

- **Instructors**
  - **Prof. Majd F. Sakr**
  - **Prof. Karem A. Sakallah**

- **TA's**
  - **Emily Leathers**

Come talk to us anytime!
(Or phone or send email)

Textbooks

Randal E. Bryant and David R. O'Hallaron,

- **"Computer Systems: A Programmer's Perspective", Prentice Hall 2003.**
- **http://csapp.cs.cmu.edu**

Brian Kernighan and Dennis Ritchie,

- **"The C Programming Language, Second Edition", Prentice Hall, 1988**

Course Components

Lectures

- **Higher level concepts**

Recitations

- **Applied concepts, important tools and skills for labs, clarification of lectures, exam coverage**

Labs

- **The heart of the course**
- **1 or 2 weeks**
- **Provide in-depth understanding of an aspect of systems**
- **Programming and measurement**

Getting Help

Class Web Page

- **http://www.qatar.cmu.edu/~msakr/15213-f07/**
- **Copies of lectures, assignments, exams, solutions**
- **Clarifications to assignments**

Message Board

- **http://autolab.qatar.cmu.edu**
- **Clarifications to assignments, general discussion**
- **The only board your instructors will be monitoring (No blackboard or Andrew)**

Personal help

- **Professors:**
  - **K. Sakallah, office hour or appt.**
  - **M. Sakr, office hour, appt, or when door is open.**
- **TAs: office hour, email, or appt.**

Policies: Assignments

Work groups

- **You must work alone on all labs**

Handins

- **Assignments due at 11:59pm on Wed or Fri evening**
- **Electronic handins using Autolab (no exceptions!).**

Makeup exams and assignments

- **Only when necessary, but must make PRIOR arrangements with Prof. Sakr.**

Appealing grades

- **Within 7 days of due date or exam date.**
- **Labs: Talk to the lead person on the assignment**
- **Exams: Talk to Prof. Sakr.**

Cheating

What is cheating?

- Sharing code: either by copying, retyping, looking at, or supplying a copy of a file.
- Coaching: helping your friend to write a lab, line by line.

What is NOT cheating?

- Helping others use systems or tools.
- Helping others with high-level design issues.
- Helping others debug their code.

Penalty for cheating:

- Removal from course with failing grade.

Detection of cheating:

- We do check and our tools for doing this are much better than you think!

Policies: Grading

Exams (40%)
- **Two in class exams (10% each)**
- **Final (20%)**
- **All exams are open book / open notes.**

Attendance & Participation (5%)

Labs (55%)
- **7 labs (6-12% each)**

Grading Characteristics
- **Lab scores tend to be high**
  - **Serious handicap if you don't hand a lab in**
  - **We offer generous redemption programs**
- **Tests typically have a wider range of scores**

Facilities

Labs will use the unix.qatar.cmu.edu servers

- **Pentium Linux servers for CS 213**
- **Your 123 accounts should still be valid.**

Getting help with the unix machines:

- **See IT**
- **Please direct questions to your TA**

Programs and Data (6)

Topics

- **Bits operations, arithmetic, assembly language programs, representation of C control and data structures**
- **Includes aspects of architecture and compilers**

Assignments

- **L1 (datalab): Manipulating bits**
- **L2 (bomblab): Defusing a binary bomb**
- **L3 (buflab): Hacking a buffer bomb**

Performance (2)

Topics

- **High level processor models, code optimization (control and data), measuring time on a computer**
- **Includes aspects of architecture, compilers, and OS**

Assignments

- **L4 (perflab): Optimizing code performance**

The Memory Hierarchy (2)

Topics

- **Memory technology, memory hierarchy, caches, disks, locality**
- **Includes aspects of architecture and OS.**

Assignments

- **L4 (perflab): Optimizing code performance**

Linking and Exceptional Control Flow (3)

Topics

- **Object files, static and dynamic linking, libraries, loading**
- **Hardware exceptions, processes, process control, Unix signals, nonlocal jumps**
- **Includes aspects of compilers, OS, and architecture**

Assignments

- **L5 (tshlab): Writing your own shell with job control**

Virtual Memory (4)

Topics

- **Virtual memory, address translation, dynamic storage allocation**
- **Includes aspects of architecture and OS**

Assignments

- **L6 (malloclab): Writing your own malloc package**

I/O, Networking, and Concurrency (6)

Topics

- **High level and low-level I/O, network programming, Internet services, Web servers**

- **concurrency, concurrent server design, threads, I/O multiplexing with select.**

- **Includes aspects of networking, OS, and architecture.**

Assignments

- **L7 (proxylab): Writing your own Web proxy**

Lab Rationale

Each lab should have a well-defined goal such as solving a puzzle or winning a contest.

Doing a lab should result in new skills and concepts

We try to use competition in a fun and healthy way.

- **Set a reasonable threshhold for full credit.**
- **Post intermediate results (anonymized) on Web page for glory!**

Autolab Web Service

Labs are provided by the Autolab system

- Autograding handin system developed in 2003 by Dave O'Hallaron
- Apache Web server + Perl CGI programs
- Beta tested Fall 2003, very stable by now

With Autolab you can use your Web browser to:

- Review lab notes, clarifications
- Download the lab materials
- Stream autoresults to a *class status Web page* as you work.
- Handin your code for autograding by the Autolab server.
- View the complete history of your code handins, autoresult submissions, autograding reports, and instructor evaluations.
- View the class status page