4190.308 Computer Architecture

Course Syllabus and Organization

CSE 컴퓨터공학부 Department of Computer Science & Engineering

Teaching Staff

- **Instructor** Bernhard Egger
  bernhard@csap.snu.ac.kr

  Office Hours Tuesdays, 9-12 in my office (301-403)

- **TA Team** Eunjin Song
  Surim Oh
  Changmin Ahn
  comparch@csap.snu.ac.kr

  Office Hours Thursdays, 9-12, 13-15
  in the CSAP lab (301-419)

Course Organization

- **Lecture**
  - higher level concepts
- **Homework Assignments**
  - every week
  - practice knowledge covered in class, small assignments
  - **prerequisite to participate in the exam**
- **Projects**
  - provide in-depth understanding of computer architecture aspects
  - larger programming assignments
- **Exams / Quizzes**
  - mid-term and final, plus random quizzes here and there
  - test your understanding of computer architecture concepts & principles

Course Logistics

- **Communication**

  eTL — the main channel of communication is through the course website on eTL. Check that site often and regularly! We consider all information posted on eTL read within three weekdays.

  Email/SMS — in certain cases we may use eTL's email/SMS functionality to transmit important information to you. All emails/SMS sent to your email address/phone number are considered read within one weekday.

  → make sure that your email address/phone number in eTL are correct. While you're at it, please also upload a current picture.

  Emails to Instructor/TA — use the course email (comparch@csap.snu.ac.kr). You can expect an answer within one weekday.

Lectures

- **Time/Location** Tuesdays, Thursdays 15:30 – 16:45
  in room 302-409
- **Material** on eTL
  http://newetl.snu.ac.kr/
- **Textbook** "Computer Systems: A Programmer's Perspective"
  Randal E. Bryant, David R. O'Hallaron,
  2nd international edition, Pearson, 2011
  (must have)

  "Computer Organization and Design:
  The Hardware/Software Interface"
  David A. Patterson, John L. Hennessy
  5th edition, Morgan Kaufmann, 2013
  (for interested students)

- **Acknowledgements** slides are based on the cs:app course at CMU

Projects

- **Material** on eTL
  http://newetl.snu.ac.kr/
- **Teamwork** unless stated otherwise, you must work alone on all assignments and projects
- **Submission** follow the instructions in the assignment
- **Late Policy** 5 grace days for the entire semester
  once grace days are used up, **20% penalty per day**
  Tip: don't spend them all on the first project

Homework Assignments

- **No teamwork** — work alone on your homework assignments
- **Submission** — - paper handins: drop-off box in class and front of the CSAP lab (301-419)
  - electronic handins: per email to the TA
- **Grading** — homework is checked, but not graded.

  Required number of submissions to participate in the
  - mid-term exam: 5
  - final exam: 5
- **Late Policy** — homework must be submitted by the deadline.

Exams

- **Two exams**
  - mid-term
  - final
- **Test your understanding of computer architecture concepts & principles**
  - blindly memorizing stuff will not help. A lot of the questions will be based on the homework and projects.
- **Exam logistics**
  - 75 minutes
  - closed book
  - one A4 page (front + back) of *handwritten* notes (original, no copy) allowed
- **Again: you need to submit five (5) homework assignments *in time* to participate in an exam (both for the mid-term and the final exam)**

Attendance & Participation

- **Attendance**
  - you are old enough to know that you should attend the lectures
  - without notice from you, we assume that you attend the class.
    If you are unable to attend a lecture, you must notify the TA until 15:45 of the same day. ***If you are found to be absent without notification, you get 0% in attendance & participation.***
  - you are allowed to skip two lectures and still get 100% attendance
  - be on time
- **Participation**
  - very much encouraged
  - participation tracking: will try chocolate paper score, may have to find other means
- **Attendance and participation are part of your grade**
  - easy points, make sure not to miss them!

Grading

- **Grading**

	prerequisite	for exams
Homework assignments		
Projects	35%	
Mid-term exam	25%	
Final exam	33%	
Quizzes	4%	plus rounding
Attendance & Participation	8%	plus rounding
Total	105%	

Cheating

- **Cheating is**
  - sharing code
  - copying code from somewhere (previous courses, Internet, …)
  - helping your friend to write an assignment/lab, line by line
  - seeking/receiving/giving any kind of help in exams
- **Penalty for cheating**
  - removal from course with “F” mark
  - notification to department/university
- **If an assignment/lab is too hard for you**
  - ask a colleague to explain the concepts
  - send an email to the TA and have him/her explain things

Language

source: http://lost-tans.blogspot.com/

A Word of Advice

- **Computer Architecture is hard**
  - a tiny mistake/oversight can lead to incorrect behavior
- **Programming requires 10% talent, 40% knowledge, and 50% experience**
  - take every opportunity you have to gain experience (homework assignments, labs, your own ideas, …)
- **This course is hard and requires a lot of time/effort**
  - read the book *before* coming to class
  - unfortunately, I cannot read minds. Ask if you don't understand!
  - start the labs early and ask if you have difficulties

On the positive side: at the end of this class, you will understand how a CPU works and as an added benefit become a better programmer

Course Schedule

Week	Date	Lecture Topic	Homework (due)	Project
1	09/01 (Tue) 09/03 (Thu)	Introduction to Computer Architecture		Bomb Lab
2	09/08 (Tue) 03/10 (Thu)	The HW/SW Interface (ISA): Basic Operations The HW/SW Interface (ISA): Arithmetic & Control	HW#1	
3	09/15 (Tue) 09/17 (Thu)	The HW/SW Interface (ISA): Control flow structures The HW/SW Interface (ISA): Procedures and Calling Convention	HW #2	
4	09/22 (Tue) 09/24 (Thu)	Processor Architecture: the Y86 Instruction Set Architecture Processor Architecture: Logic Design	HW #3	
5	*09/29 (Tue)* 10/01 (Thu)	*(public holiday (Chuseok) – no class)* → ***10/16 09:30-10:45 in 301-107*** Processor Architecture: Sequential Implementation	HW #4	Processor Lab
6	10/06 (Tue) 10/08 (Thu)	Processor Architecture: Sequential Implementation Processor Architecture: Pipelining Basics	HW #5	
7	10/13 (Tue) 10/15 (Thu)	Processor Architecture: Pipelined Implementation The Memory Hierarchy: Introduction	HW #6	
8	10/20 (Tue) 10/22 (Thu)	Recitation Mid-term examination *(class cancellation deadline: 10/21)*	HW #7	

Course Schedule

Week	Date	Lecture Topic	Homework (due)	Project
9	10/27 (Tue) *10/29 (Thu)*	The Memory Hierarchy: Cache Memories *(reading period – no class)*		
10	11/03 (Tue) 11/05 (Thu)	The Memory Hierarchy: Virtual Memory – Concepts	HW#8	Cache Lab
11	11/10 (Tue) 11/12 (Thu)	The Memory Hierarchy: Virtual Memory – Implementation	HW #9	
12	11/17 (Tue) 11/19 (Thu)	Advanced Topics: Parallel Architectures	HW #10	
13	11/24 (Tue) 11/28 (Thu)	Advanced Topics: Virtualization	HW #11	
14	12/01 (Tue) 12/03 (Thu)	Advanced Topics: Modern Processor Architectures	HW #12	
15	12/08 (Tue) 12/10 (Thu)	Recitation Final examination	HW #13	
16	12/15 (Tue) 12/17 (Thu)	Make-up classes		

"no plan survives contact with reality"

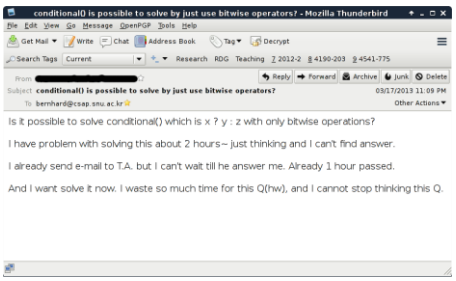
Classroom Etiquette

Dos and Don'ts

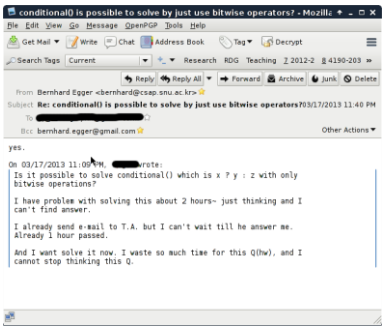
- Dos
  - come to class **to listen, learn, and participate**
  - turn your **mobile phone off/on mute and put it away** during class
- Don'ts
  - **no food and drinks** allowed in the classroom / lab
    - exception: exams
  - **no hats, baseball caps**, etc
    - exception: cover for religious reasons
  - **don't use your tablet, laptop**
    - except to follow the lecture

E-Mail Etiquette

Example



The Answer



Don'ts

- Meaningless subject
  - "URGENT"
  - "I need help"
- Empty body
  - Subject: Need help with the data lab
- No/impolite greetings, salutation
  - Hi, prof!
- Smileys, emoticons, excessive use of punctuation, etc
  - Help me please ^**^ ☺ ORZ.....!!!!
- Expecting an answer within 1 hour

Dos

- State your name, student-number, and class
- Use a meaningful subject
- Be polite
  - salutation
    - Dear Prof. Egger
    - Dear TA
  - greetings
    - Best,
Cheolsoo Lee
2014-12345
- Write some content!

Dos

- Example

  [CompArch] Question regarding Homework #3

  Dear TA,

  I have tried to download the paper as instructed in the handout, but the link to the external material in homework #3 seems to be broken. Could you please check? Thank you!

  Best regards,
Cheolsoo Kim
2014-12345