COURSE SYLLABUS

Course Number: CS152A, CS152B
Title: Computer Organization
Department/Program: DISCS
School: Science and Engineering
Semester: 1st
School Year: 2015-2016
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A. COURSE DESCRIPTION

This course studies the organization of a computer and how it functions, from electrical signals and transistors to assembly language and memory. This course is divided into three parts. The first part covers the basics of digital design and the building blocks of computers. The second part is the organization of the computer as composed by the building blocks studied in the first part. The third part deals with assembly language programming and an implementation of hardware studied in the second part.

B. COURSE OBJECTIVES

By the end of this course, students should be able to:
- identify and explain the hardware structures that make computers possible
- identify the different devices and components of a computer system (down to the transistor level) and explain how these components interact and work together
- apply different architectural techniques such as pipelining and caching, and identify issues in applying these techniques
- program in a RISC assembly language (including how to translate and optimize high-level programs in C to RISC assembly language)
- build a simple 32-bit RISC CPU from simple logic gates using a hardware description language

C. COURSE OUTLINE

WEEK	LEARNING OBJECTIVES	ACTIVITIES	STUDENT OUTPUT
August 10, 12, 14	- Introduction - Computation - Information - The Digital Abstraction - Transistors as Building Blocks	- Lectures - Laboratory Exercises	- Quizzes - Laboratory Reports and/or Programs
August 17	- Static Discipline	- Lectures - Laboratory Exercises	- Quizzes - Laboratory Reports and/or Programs
August 24, 26, 28	- CMOS Gates - Basic Digital Logic	- Lectures - Laboratory Exercises	- Quizzes - Laboratory Reports and/or Programs
September 2, 4	- Basic Optimization - Mux / Demux - Programmable Logic	- Lectures - Laboratory Exercises	- Quizzes - Laboratory Reports and/or Programs
September 7, 9, 11	- Feedback Circuits	- Lectures - Laboratory Exercises	- Quizzes - Laboratory Reports and/or Programs - Long Test #1
September 14,16,18	- Delays - SIC Rule	- Lectures - Laboratory Exercises	- Quizzes - Laboratory Reports and/or Programs
September 21,23,25	- Clock Timing - Minimum Clock Period - Basic Pipelining	- Lectures - Laboratory Exercises	- Quizzes - Laboratory Reports and/or Programs
September 28, 30 October 2	- Finite State Machines - Moore and Mealy - Optimization via Reduction	- Lectures - Laboratory Exercises	- Quizzes - Laboratory Reports and/or Programs
October 5, 7, 9	- Datapaths - FSM as a Controller - Microprogramming VS Hardwired Control	- Lectures - Laboratory Exercises	- Quizzes - Laboratory Reports and/or Programs - Long Test #2

October 12, 14, 16	- Machine Language - Beta Assembly Language	- Lectures - Laboratory Exercises	- Quizzes - Laboratory Reports and/or Programs
October 19, 21, 23	- Beta Assembly Language	- Lectures - Laboratory Exercises	- Quizzes - Laboratory Reports and/or Programs
October 26, 28, 30	- Translating High-Level Languages to Assembly	- Lectures - Laboratory Exercises	- Quizzes - Laboratory Reports and/or Programs
November 2, 4, 6	- Function Calls	- Lectures - Laboratory Exercises	- Quizzes - Laboratory Reports and/or Programs - Long Test #3
November 9, 11, 13	- Caching ("cashing", not “ka-ching”) - Purpose - Basic Types - Measuring Performance	- Lectures - Laboratory Exercises	- Quizzes - Laboratory Reports and/or Programs
November 16,18,20	- Implementing the Beta in Hardware	- Lectures - Laboratory Exercises	- Quizzes - Laboratory Reports and/or Programs
November 23,25,27	- Pipelining the Beta - Pipelining Hazards - Software Solutions	- Lectures - Laboratory Exercises	- Quizzes - Laboratory Reports and/or Programs
December 2, 4	- Hardware Solutions - Parallel Processing	- Lecture - Discussion	- Quizzes - Laboratory Reports and/or Programs
December 7-11 (Finals)			- Long Test #4

D. TIMEFRAME

For the tentative timeframe of this course’s coverage, see the previous section. However, please note the following:

- Laboratory-related matters are applicable only to CS152b.
- CS152a and CS152b are separate subjects. A delay in one (for example, classes are suspended) will not necessarily disrupt the schedule of the other.
- Depending on the actual pace of the course, subject matter may be added or skipped, deadlines may be moved, etc.

E. REQUIRED READING

All lecture slides and handouts will be made available on our course website on DISCS Moodle (http://curry.ateneo.net/moodle/course/view.php?id=113).

F. SUGGESTED READINGS

MIT 6.004: Computation Structures web site. http://6004.lcs.mit.edu/

Stallings, William, Computer Organization and Architecture. 10th ed., Pearson Education, 2015.

Hennessy and Patterson, Computer Architecture: A Quantitative Approach. 5th ed., Elsevier Science & Technology, 2011.

Patterson and Hennessy, Computer Organization: The Hardware / Software Interface. 4th ed., Morgan Kaufmann, 2008.

Tanenbaum, Andrew, Structured Computer Organization. 3rd ed., Pearson Education, 2008.

Katz and Borriello, Contemporary Logic. 2nd ed., Pearson Prentice Hall, 2005.

Gajski, Daniel, Principles of Digital Design, Prentice Hall, 1997.

Prosser and Winkel, The Art of Digital Design: An Introduction to Top-down Design. 2nd ed., Prentice-Hall, 1987.

Any digital design/electronics book or computer organization/architecture book

G. COURSE REQUIREMENTS

Quizzes	20%	(Counts as attendance. Usually 5 points each.)
Long Tests	20% [x4]	(LT#4 = Finals. All LT's are not comprehensive. Capped at 105/100 each.)
Total for CS152a	100%	
Lab Exercises	100%	(Weight per lab exercise may vary and are subject to peer evaluation.)
Total for CS152b	100%	

H. GRADING SYSTEM

Since this is an undergraduate course, the undergraduate grade system for CS courses will be followed.
Cumulative grade totals *greater than or equal to 60* will be rounded up.

< 60	F	(Fail)
60 - 68	D	(Barely Passing)
69 - 74	C	(Passing)
75 - 80	C+	(Fair)
81 - 86	B	(Good)
87 - 92	B+	(Very Good)
>= 93	A	(Excellent)

I. CLASSROOM POLICIES

1. Kindly arrive on time, as being late will distract everyone in the room.

2. All cellular phones must be off or in silent mode during class time.

3. Students should check the course website on Moodle for class updates and be reachable by the class beadle.

4. Quizzes will be given occasionally. It is your responsibility to be ready when you come to class. Unannounced quizzes may be given during lecture hours. These quizzes are used to check attendance. No quiz = no attendance check. Be reminded that it is still your responsibility to find out what you missed on days that you were absent. ALWAYS BRING A CALCULATOR AND A BLANK SHEET OF 1/4 PAD PAPER. Students that purposely delay the start of a quiz for any reason (need to borrow a 1/4 from classmates, etc.) will be asked to step out.

5. No make-up quizzes. No make-up exams or exercise/project deadline extension unless you were hospitalized or an immediate member of your family died (grandparents and legal guardians included) or there were circumstances that prevented you from coming to class. Adequate proof must be provided (e.g. medical certificate, news report) and the hospitalization/wake/disaster/aftermath period must cover the date of the exam or report deadline. All bonus point opportunities are removed for make-up tests.

6. Each lab exercise is a program that demonstrates one or more circuit design concepts covered in class.
   - Specifications, formats, and such will be announced during the lab exercises themselves.
   - Printed lab reports must include a certificate of authorship.

7. The certificate can be found here: http://www.ateneo.edu/ls/sose/iscs/downloads

8. Late group deliverables are subject to deductions (-10% of maximum score per day late, rounded up).

9. Peer evaluation: For each group deliverable, each student must personally submit to their instructor a folded 1/4 sheet of paper containing their name, the name of their partner, and a score ranging from 1 to 5 that they are giving their partner:
   - A score of 1 would mean that person was completely useless. As in ZERO participation.
   - A score of 2 would mean that person hardly did anything and was often doing something unrelated.
   - A score of 3 would mean that person did some work but should have participated more.
   - A score of 4 would mean that person participated and did their fair share of work.
   - A score of 5 would mean that person was TOTALLY AWESOME but sadly this still counts as a 4.

   **** No fractions allowed.***
   **** Any score below 4 must be accompanied by a short VALID explanation/reason/example/etc.***
   **** Any score of 1 or any average score lower than 3 will result in your instructor meeting with the group.***
   **** Failure to follow instructions will result in you receiving a -1 penalty to your average peer evaluation score.***
   **** Failure to submit peer evaluation will result in you receiving a -1 penalty to your average peer evaluation score.***

   Peer evaluation scores will be averaged and rounded down then converted to a multiplier for that particular deliverable:
   - 3.7~ = 100% of the grade for the activity in question
   - 3.4~ = 95% of the grade
   - 3.0~ = 90% of the grade
   - 2.5~ = 85% of the grade

- 2~ = 80% of the grade - 1~ = 0%

10. Peer evaluation requirement obviously does not apply if a “group” is comprised of only one student.

11. In the event of a group split for any reason, students' scores from their previous group will still apply to them. Both members will also be restricted to working as individuals (no merging with another solo).

12. Excess points: Because of the existence of bonus points, exceeding the maximum point total for certain requirements is possible. However, excess points will not allow you to exceed the maximum for the converted percentage grades listed in the Course Requirements section. For example, even if you get 105/100 in all your tests, the grade does not get converted to 84%, since it is capped at 80% of your grade. However, if you get 105, 105, 105, and 85, you still get 80%.

13. Grades below 60 are NOT rounded off, even if the grade is 59.9999~~~

14. Please submit a 3x5 index card* with the following (write LEGIBLY) in front:
    - 1x1 picture of yourself (If we cannot recognize you in the picture, we will not accept it.)
    - Name (last name then first name, please)
    - Nickname (enclosed in double quotation marks)
    - Course and ID number
    - At least one of the following: e-mail address/landline/mobile
    - With the remaining space IN FRONT, draw something, anything… well, almost anything.

    * If you have had either instructor as a teacher before in any subject, you might not need to do this since there is a chance that we still have your index card (regardless of size or format) from a previous subject.
    ** Cards that do not follow the correct size or format will not be accepted.

15. To facilitate a better learning experience, CS152b sessions may be replaced with CS152a sessions (and vice versa) at the instructor's discretion.

16. No extra-credit work will be issued. Ever. Even if you ask nicely. We will ignore any requests for extra-credit work regardless of the circumstances that led to your making the request.

17. More policies may be added should the need to do so arise. However, these will require your consent if they are not issued by the department chair or another university authority.

J. CONSULTATION HOURS

You may e-mail concerns to us at our respective e-mail addresses. (Subject: [choose one: CS152a / CS152b] - [fill in this part]) Should you need to consult with us, please set up an appointment first so we know when to expect you.

Diy, Walfrido David	By appointment
Ty, Jayzon	By appointment