SYLLABUS

1. Professor: Haldun Hadimioglu

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   http://cis.poly.edu/haldun

2. Course format:

   Lecture Section: 1924
   Recitation Sections:
   ⇒ A (1925, Friday 9 - 10:50)
   ⇒ B (1926, Friday 2 - 3:50)
   ⇒ C (2070, Friday 4 - 5:50)

3. Prerequisites: One of the following two:

   ⇒ CS2204 (Digital Logic and State Machine Design, C- required)
   ⇒ CS2134 (Data Structures & Algorithms, C- required) & MA2312&MA2322 (Discrete Math 1&2)

4. Course web page: http://cis.poly.edu/cs2214
   ⇒ Course handout and presentation files are at the course web site

5. CS2214 is the second course on digital hardware, following Digital Logic
   ⇒ It is the first course to design digital systems, such as microprocessors & computers!

6. Textbook:


   ⇒ Publisher’s web site, http://books.elsevier.com and the CD that comes with the book have a large amount of material. Students are strongly suggested that they study them. The CD has various sections related to the chapters and tutorials, software packages and other supporting material.

7. CS2214 Recitations:

   Recitations aim at reinforcing and complementing the lectures. They help students understand subjects discussed in class better.

   ⇒ Recitations cover new topics besides covering lecture topics in detail. It also presents practical aspects of topics covered during the lecture. In addition, the recitations are intended to discuss homework assignments.

   ⇒ Students who attend recitations are faster at solving problems.
The recitations are given in several different sections. Each section has one hour and 50 minutes a week. Recitation sessions are given by teaching assistants (TAs). Students cannot attend the recitation of other sections. Attendance is recorded during every recitation.

Students in each recitation section form 3- or 4-member teams by the third week of the semester. Team members do the homework assignments together until the end of the semester.

8. Homework:
There will be seven homework assignments. The homework will be submitted by teams. A late submission will not be accepted.

- Students who do homework are faster at solving problems. Students are suggested to study the textbook problems that are on the textbook CD, besides the ones given in the textbook. Showing work (intermediate steps) is required to get full/partial credits on a question. The homework is graded by the section TA. Although, the homework will not affect the term grade, it can help raise grades as described below.

- Homework assignments include modified past exam questions and answers to help learn chapters and solve homework problems. Students need to study them before they solve homework problems, not before exams. Note that, these past exam questions are samples and do not give hints about exams this semester.

9. Exams:
There will be two 110-minute midterm exams and a three-hour final exam. The exams will cover class and recitation topics.

- Showing work (showing intermediate steps) is required to get full credits on a question. That is, both the final answer and the steps to get it, the approach, are important.
  - These steps are given in class and past exam solutions. Therefore, students are expected to solve exam questions as such. Showing the approach also helps students acquire and improve their documentation skills, critical for the technical world.
  - In order to facilitate this, the exams are open book exams: Students can use their own material, i.e. their books, notebooks, homework and handouts during the exams. Note that once the exam starts there is no sharing.
  - Students must prepare for the exams as if they are closed book exams!

- In addition, remembering the following is needed during the exams:
  - No multiple answers to a question,
  - Precise answers to questions, no answers like “the rest is similar,”
  - Answering the question asked, and
  - Using the exam booklet space well: For example, start a new question on a new page.

10. Term Grade:
The term grade is calculated as follows:

\[
\begin{align*}
25\% & \text{ Exam I} & 25\% & \text{ Exam II} & 50\% & \text{ Final Exam}
\end{align*}
\]
The homework does not affect the term grade directly but it is taken into account when a student’s term grade is near a grade “border.” Also, taken into account is attendance. If they are good, the grade is raised. Finally, the professor may change the term grade computation. Thus, students are strongly suggested that they fulfill the requirements of the course, i.e. recitations, lectures and homework assignments.

11. Office Hours:
The professor has an open-door policy that if he is not busy, students can ask questions in his office. If the door is closed, he might be teaching or at a meeting. If a student wants to see the professor at a certain time, he/she makes an appointment with the professor.

Students can use email. But, they are strongly suggested that they see the professor to ask questions, instead of sending email. If email is sent, a Polytechnic email address must be used and student’s name and section must be included. Broadcast messages will be sent to the class to make announcements. Note that grades are not given out to students via email or telephone. Students need to see the professor to learn their grades.

TA assignments and their contact information will be given later in the semester.

12. Material Coverage:
All chapters, except Chapter 6, will be covered, some partially, some completely this semester. Students will be given additional material in class. The tentative schedule is as follows:

<table>
<thead>
<tr>
<th>Day(s)</th>
<th>Subject</th>
<th>Chapters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 27, 29</td>
<td>Introduction. Computer systems overview. Layered computer design</td>
<td>1, A, E</td>
</tr>
<tr>
<td>Jan 29, Feb 3, 5, 10, 12, 19, 24</td>
<td>The architecture of the EMY computer</td>
<td>1, 2, 3, A, E</td>
</tr>
<tr>
<td>Mar 10</td>
<td>Exam I</td>
<td>HW : 1 - 2</td>
</tr>
<tr>
<td>Feb 26, Mar 3</td>
<td>Digital system design fundamentals</td>
<td>4, A, B, D</td>
</tr>
<tr>
<td>Mar 3, 5, 12</td>
<td>The organization of the EMY computer. EMY CPU design. Hardwiring</td>
<td>4, A, B, D</td>
</tr>
<tr>
<td>Apr 2</td>
<td>Exam II : Cumulative</td>
<td>HW : 1 - 4</td>
</tr>
<tr>
<td>Mar 24</td>
<td>EMU CPU design. Microprogramming.</td>
<td>4, A, B, D</td>
</tr>
<tr>
<td>Mar 26, 31, Apr 7, 9</td>
<td>Pipelining</td>
<td>4, A</td>
</tr>
<tr>
<td>Apr 9, 14, 16, 21, 23, 28</td>
<td>Semiconductor memory. Memory hierarchies</td>
<td>5, A, B</td>
</tr>
<tr>
<td>Apr 30</td>
<td>Performance measures</td>
<td>1, 4, A, B, D</td>
</tr>
<tr>
<td>May 5</td>
<td>High-speed computer design and future projections</td>
<td>6, C</td>
</tr>
<tr>
<td>TBA</td>
<td>Final Exam : Cumulative</td>
<td>All the above chapters</td>
</tr>
</tbody>
</table>
13. References:
Students are suggested that they study recent computer architecture books since the field advances rapidly. The following references are recommended with respect to their relevance to the course and the textbook:


☞ A book giving insight on microprocessor design from the concept phase to the production phase:

☞ A book describing how and why technical work involved in computer design and development is just a small part of a larger picture with emotions, ambitions and conflicting goals of many people involved:

14. ABET Core Competencies:
CS2214 addresses the following ABET a-k competencies:

a) Students apply mathematics, science and engineering knowledge to design and analyze advanced systems.

e) Students design a digital system that meets the desired speed, space and cost contraints.

e) Students identify, formulate and solve engineering problems.

15. Reminders about the course:
Students are required to read the web pages whose links are provided with at the course web site:

1) **NYU-Poly Code of Conduct web page** : http://www.poly.edu/academics/code-of-conduct
2) NYU-Poly Life page web page with links to Health+Wellness, Campus Safety, Students Resources and other : http://www.poly.edu/life. In addition, keep the following in mind :

a) Always keep contact with the professor and discuss your personal matters in professor’s office.

b) A successful course experience : To enjoy the course as much as possible and be ready for the follow up courses, students need to be committed to the course

⇒ Attending classes and recitations and doing the work are needed.
⇒ Lectures are dependent on each other and recitations are also dependent on each other.
⇒ Study the notes, books, handouts. But, just reading does not mean studying ! Also, do the homework !

c) Students must realize that every action they take has consequences. They also should not make assumptions and decisions on the course (the exams, lectures, recitations, the homework and attendance) without asking the professor. An assumption that is often made by students is that every course is the same. This is not the case !

d) A reason for a low grade is missing classes and recitations. Even if one gets the notes, it does not help. This is because :

⇒ The notes taken from the board may not be correct.
⇒ Someone taking the notes may not write down all the verbal comments and suggestions made by the professor.
⇒ Attending classes and recitations forms better memory because of visual (seeing the writing on the board), audio (listening to the professor) and tactile (writing down the notes) inputs.
⇒ During lectures and recitations, the professor and TAs refer to earlier lectures and labs (past topics, comments, suggestions, etc.) which refreshes students’ memory and further reinforces their knowledge.

Overall, students learn and remember more. Finally, since their memory is fresh, students save time when they study for exams.

e) Missing an exam is not a minor case. A careful assessment is made to excuse a student or to grant an incomplete to a student. The professor makes the decision. The decision is made also based on the information by the student’s academic department and the Student Affairs Office.

One of the requirements to excuse a student is that at the time the student is not able to take the exam, he/she be in good standing in class, i.e. has good attendance, a good homework performance, a good recitation performance and a good exam performance : The professor wants to see that the student has been committed to the course and learning the material has been his/her main objective.

A student who is excused from a midterm exam is not given a make-up exam. The weight of the midterm exam is distributed to the other exams at the discretion of the professor. The make-up exam for the final exam will be harder than the one given to the whole class.

If a student experiences any problem, including health/personal problems, he/she must immediately contact Judith Simonsen who is the director of the Student Development Office : jsimonse@poly.edu. Her number is (718) 260-3046. Her office number is LC 240C.

f) For a course, the semester is over when the final exam is over. Students are not given extra work, a project, a make-up exam or any other kind of special treatment to raise their grade during or after the semester.

g) Some students do not know/follow NYU-Poly and CS2204 rules and regulations nor seek advice from Polytechnic staff. Students are strongly suggested that they speak with the professor, the TAs, the major advisor, the personnel of the Student Affairs Office, and the Counseling Center.
16. Professor’s message:

➜ Focus on learning and thinking!
➜ More importantly, focus on motivating yourself to learn more and think more!
➜ Knowledge is not finite!

⇒ As a student, you will use your motivation to learn and think to learn more of each topic!
⇒ Students consider the learning and thinking style shown on the left not the one on the right:

<table>
<thead>
<tr>
<th>Learning, thinking and motivating yourself? WHY?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation ➞ Learn ➞ Success ➞ Graduate, work, be healthy, be happy ➞ Enjoy life</td>
</tr>
<tr>
<td>Learn ➞ Think ➞ Explore ➞ Failure</td>
</tr>
<tr>
<td>Motivation is needed to keep the cycle going</td>
</tr>
<tr>
<td>Joy ➞ Discover ➞ Think</td>
</tr>
<tr>
<td>Knowledge is not finite &amp; the world is not predictable</td>
</tr>
</tbody>
</table>

⇒ Students are suggested that they read the following book that describes the cycle on the left above:

17. Benefitting from the course for the years before and after graduation:

⇒ Industry and academia look for graduates who can solve problems, are systems oriented and creative
⇒ In order to accomplish these you need to have
⇒ Analytical skills, synthesis skills and team work skills
⇒ For these three skills, you will need to develop critical thinking and personal skills for which you need to do the following
⇒ Learning is your target!
⇒ You interact with people to work on a problem, to exchange ideas, to help, etc.!
⇒ After graduation, the most common way you will be judged is how you write
⇒ Concentrate on documentation!
⇒ Homework and exams help you practice writing: Students show work, not just the final answer
⇒ Students understand and satisfy goals of the course that are intellectual, technical & non-technical:
   1) The intellectual goals are that students learn how to learn fast and are critical thinkers.
   2) Technical goals are for a successful technical career: Acquiring skills to be systems oriented and a problem solver as well as acquiring the necessary course content which is digital logic:
   ⇒ Main technical topic: Digital systems, such as microprocessors, computers, calculators, DVDs, iPhones. The course focuses on developing a computer, by designing its architecture and then the organization (microarchitecture) layers:
   ⇒ Designing the architecture: Machine language instruction set design and programming
   ⇒ Designing the organization includes learning the skills to design a computer with a single processor (single-core) and understand its subsystems and their interaction.
   ⇒ The processor, one of the three subsystems of a computer, is the Central Processing Unit, the CPU. The other two subsystems are the memory and Input/Output (I/O) controller. The computer we design is named EMY and is based on a commercial microprocessor, the MIPS.
   ⇒ Digital system design is covered in the context of state machine design & EMY computer.
   3) The non-technical goals include acquiring and improving skills needed for interacting with and managing people in various environments. They are needed in the technical world which is team-based and becoming more global.