Dear Students,

Welcome to the CS 6133 INET Section for Fall 2017. It's a great pleasure to have you in this course!

Instructor Contact Info.: Prof. Ping-Tsai Chung
http://engineering.nyu.edu/people/ping-tsai-chung
Email: ptc259@nyu.edu, Phone: 646-491-2110
F2F Office hours: By appointment
Office: 2 MetroTech Center, 10th Floor, Room 10.098
Class Materials will be posted every Tuesday, you could view them and participate class activities anytime during the week.
Online Office hours: by dropping your messages to my email anytime. I will response you within 24 hours.

Course Description:
This course provides students with an understanding of computer-hardware subsystems, digital design strategies and fundamental computer-performance and capacity-improvement techniques. Combinational and sequential circuits are developed for the essential building blocks of computers. Binary number systems are presented in both human and computer algorithms. A uniprocessor computer is built from the blocks developed. An assembly language and an instruction set are presented. Processor implementation with a data path and hardwired and microprogrammed control is introduced. Performance evaluation of computers is studied. Basic pipelining is introduced to improve system performance. Memory-hierarchy alternatives are introduced to improve the capacity of the computing system.

Course Pre-requisites: Graduate Standing

A remark noted by Instructor:
We are gradually increasing the level of CS 6133 since the CS curriculum has been changed by the course committee. In CS 6133 Computer Architecture I for Fall 2017, we assume students know Digital Logic. The Topics cover Introduction and overview, MIPS Architecture, Unpipelined MIPS CPU design, Cache memory, Main memory, Virtual memory, Pipelined Integer MIPS CPU Design, Pipelined Floating Point with Integer MIPS CPU, Tomasulo MIPS CPU Design, and Emerging technologies and wrap up.
**Course Objectives:**
(O1) Could have good understanding of Computer Architecture, Instruction Set Principles, the MIPS Instruction Set, and the MIPS Architecture.

(O2) Could have good understanding of the Datapath and Control, CPU System, Processor Implementation with a Data path and Hardwired and Microprogrammed Control.

(O3) Could have good understanding of Memory Hierarchy Techniques including Optimization of Cache Performance, and Virtual Memory to improve the capacity of the computing system.

(O4) Could have good understanding of Performance Evaluation of Computers for measuring, reporting, and summarizing performance and Quantitative Principles of Computer Design.

(O5) Could have good understanding of Pipelining Techniques to improve system performance.

(O6) Could have good understanding of MIPS CPU, Tomasulo MIPS CPU Design.

(O7) Could have good understanding of Emerging technologies for Computer Architectures.

**Course Structure:**
This course is an online-based course which consists of Lecture Notes, Lecture Guidelines & Activities including readings, lecture related exercises, homework assignments, Term Project & presentation, Midterm Exam, and Final Exam.

**Weekly Outline:**

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<tr>
<th>Schedule</th>
<th>Topics Covered</th>
<th>Resources</th>
<th>Assignments</th>
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<tr>
<td>Lecture 1</td>
<td>Introduction and Overview Measuring, Reporting, and Summarizing Performance. Quantitative Principles of Computer Design.</td>
<td>Notes and Ch. 1</td>
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<td>The week of (9/5)</td>
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<tr>
<td>Lecture 2</td>
<td>Instruction Set Principles – Introduction; Classifying Instruction Set Architectures; Memory Addressing; Type and Size of Operands; Operations in the Instruction Set;</td>
<td>Appendix A and Notes</td>
<td>Homework 1</td>
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<td>The week of (9/12)</td>
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<td>Lecture 3</td>
<td>The week of (9/19)</td>
<td><strong>Instruction Set Principles</strong> – MIPS Instruction set; Crosscutting Issues: The Role of Compilers; Putting It All Together. <strong>MIPS Architecture</strong></td>
<td>Appendix A and Notes</td>
</tr>
<tr>
<td>Lecture 4</td>
<td>The week of (9/26)</td>
<td><strong>The Processor Design</strong> – Introduction; The finite state diagram of the processor with a subset of instructions; Its Datapath.</td>
<td>Notes</td>
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<td>Lecture 5</td>
<td>The week of (10/3)</td>
<td><strong>The Processor Design</strong> – The processor control unit with hardwiring and microprogramming <strong>Unpipelined MIPS CPU design</strong></td>
<td>Notes</td>
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<td>Lecture 6</td>
<td>The week of (10/10)</td>
<td><strong>Memory Hierarchy</strong> - Introduction; Cache memory design; Cache memory performance; Improving cache performance.</td>
<td>Ch2, Appendix B and Notes</td>
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<td>Lecture 7</td>
<td>The week of (10/17)</td>
<td><strong>Memory Hierarchy</strong> Main memory design; Virtual Memory Translation-Lookaside Buffer design; Concepts of Memory Interleaving - Multiple Memory Banks.</td>
<td>Appendix B and Notes</td>
</tr>
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<td>Lecture 8</td>
<td>The week of (10/24)</td>
<td><strong>Midterm EXAM</strong> – October 29, 2017, Sunday, 2:00 ~ 5:00PM through Examity Service, a computer-based remote proctoring service.</td>
<td>Exam Covers above topics Based on Homework 1, 2, 3 and Examples of Class Notes</td>
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<tr>
<td>Lecture 9</td>
<td>Midterm Exam. Discussions</td>
<td>Appendix C and Notes</td>
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<td>The week of (10/31)</td>
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<th>Lecture 10</th>
<th>The Processor – Pipelined Integer MIPS CPU Design Pipelined Processor Design – An Overview of Pipelining; Pipelined Datapath; Structural Hazards. Pipelining: Data and control hazards; MIPS CPU.</th>
<th>Appendix C and Notes</th>
<th>Homework 4</th>
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<th>Lecture 11</th>
<th>Pipelined FP+Int MIPS CPU</th>
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<th>Lecture 12</th>
<th>Tomasulo MIPS CPU Design</th>
<th>Ch3 and Notes</th>
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<th>Lecture 13</th>
<th>Tomasulo MIPS CPU Design (Continue)</th>
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<th>Lecture 14</th>
<th>F2F Term Project Presentations, Dec. 3, Sunday, 2~6PM (Classroom-TBD)</th>
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<th>Lecture 15</th>
<th>Emerging technologies and wrap up</th>
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<tr>
<th>Lecture 14</th>
<th>Final EXAM – December 17, 2017, Sunday, 2:00 ~ 5:00PM through Examity Service, a computer-based remote proctoring service.</th>
<th>Exam Covers above topics Based on Homeworks, Examples of Class Notes</th>
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<td>The week of (12/17)</td>
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**Required Textbook:**

**Course requirements:**
**GRADING CRITERIA, GUIDELINES, AND ASSIGNMENTS:**

**Course Grading:** Class Lecture Participation & Homework Assignments: 20%, Term Paper: 20%, Midterm Exam: 30%, and Final Exam: 30%

**Note 1** *(Grading Grid for Final Grades)*: 90% and higher (A), 75% – 89.99% (B), 60 -74% (C), below 60% (F). *Final Grades will be curved through class and Intermediate grades (A-, B+, …, etc. ) will be given. 90% and higher achievements will be guaranteed to receive a final grade “A”.*

**Note 2** *(NYU Classes)*
- All lectures will be met through NYU Class in online formats unless special arrangements for Examinations (through Examity Service, a computer-based remote proctoring service.) and F2F Term Project Presentations (Classroom-TBD).
- Lecture notes will be delivered on every Tuesday through asynchronous way, students could access course materials in their convenience during the week.

**Note 3** *(Class Participation)*:
- The professor tries to stimulate class interactions. Student should participate Course Activities including Lectures, Activity Participations, Assignments, and Examinations through Examity Service, a computer-based remote proctoring service.
- For each lecture, students should participate lecture activities through forum, or meeting discussions, and work on reading assignments (Class Lecture Participation 10%).

**Note 4** *(Class Exercise & Homework Submission)*:
- All Class Exercises and Homework Assignments should be submitted to NYU Classes by the specified deadline.
- **No late homework will be accepted.**
- There will be several Class Exercises and five homework assignments.
Alternative solution will be considered (you should understand that there is often no single answer).

The Gradebook at NYU Classes will be used to post Class Exercise and Homework grades.

**Note 5 (Term Paper Progress Submissions):** All Term Paper Progress submissions should be submitted to ptc259@nyu.edu by the specified deadline.

**The Face-to-Face Term Project Presentations Dec. 3, Sunday, 2~6PM (Classroom-TBD).**

**Note 6 (Exams):** There will be a 3-hour midterm exam and a 3-hour final exam. Showing work (intermediate steps) is required to get full/partial credits on a question. Both exams will be proctored by Examity Service, a computer-based remote proctoring service. The Gradebook at NYU Classes will be used to post exam grades.

**The Midterm EXAM – October 29, 2017, Sunday, 2:00 ~ 5:00PM through Examity Service.**

**The FINAL EXAM – December 17, 2017, Sunday, 2:00 ~ 5:00PM through Examity Service.**

**ACADEMIC INTEGRITY AND REGULATIONS:** Students are required to read the following web pages:

- **NYU-Poly Code of Conduct** web page: [http://www.poly.edu/academics/code-of-conduct](http://www.poly.edu/academics/code-of-conduct)
- **NYU- Tandon School of Engineering Life page** web page with link to Health+Wellness, Campus Safety, Students Resources and other: [http://engineering.nyu.edu/life](http://engineering.nyu.edu/life)

**Policy on Academic Dishonesty:**

NYU School of Engineering Policies and Procedures on Academic Misconduct

A. **Introduction:** The School of Engineering encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School of Engineering are expected to exhibit those qualities in their academic work. It is through the process of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated. Furthermore, those who breach the School’s rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School’s Policy on Academic Misconduct.

B. **Definition:** Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a
grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:

1. Cheating: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person’s work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.

2. Fabrication: including but not limited to, falsifying experimental data and/or citations.

3. Plagiarism: intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.

4. Unauthorized collaboration: working together on work that was meant to be done individually.

5. Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission has been received from the course instructor(s) or research adviser involved.

6. Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.

**Moses Center Statement of Disability:**
If you are student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities (CSD) at 212-998-4980 or mosescsd@nyu.edu. You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at http://www.nyu.edu/students/communities-and-groups/students-with-disabilities.html. The Moses Center is located at 726 Broadway on the 2nd floor.

**Reminder:** Students are asked to remember the following points throughout the semester:

- The professor requests that student interact with him via NYU Classes or email or by coming to his office or calling if possible to discuss matters quickly.
- Student should show strong motivation to learn and persistence. Student learns to learn proactively. Summarize in your own words whatever you learned.
- 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 based on the information on the student provided by the academic department and the Student Development 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 on the course, i.e. has a good participation, a good homework performance,
and a good exam performance. That is, the professor wants to see that the student has
been committed to the course and learning the material has been his/her main
objective.

For a course, the semester is over when the final exam is over. Students will not
be 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.

Students are strongly recommended that they not make assumptions and
decisions on the course (exams, lectures, the homework and the course
participation) without asking the professor. Ask professor if you do not
understand. Tell professor if you cannot keep up.

The professor expects that students study at the pace of the professor. The professor
helps you to learn the course well.

Dear Students

Again, welcome to the CS 6133 INET Section for Fall 2017. It's my
pleasure to have you in this Course. Should you have any questions,
please do not hesitate to let me know, simply send your message to
me.

Best,

P. T. Chung

Instructor
CS 6133 Computer Architecture I (class# 14927) for Fall 2017