

**EE557 -- Computer Systems Architecture**  
**Fall 2012**  
**Sections 30628D (den) and 30630D (on-campus)**

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Office hours: 11-12 am MW.

**PRELIMINARY SYLLABUS**

## **1. Overview**

The main objective of EE557 is computer architecture exploration at a more abstract level than in previous courses on architecture. Because architectures are described at a block diagram level a large number of machines, memory structures, and interconnections will be taught. In ee457, we learned how to design a simple five-stage pipeline in great details, down to the circuit level. In ee557, we assume that these implementation details are known. We will learn about computer systems as they are designed today, including processors, memories, interconnects and multiprocessors. The focus of the course is not on research but on actual, commercial, existing machines. At the end of the class (course wrap-up) we will discuss some research issues. These issues are the topics of EE653, EE657, EE659 and EE677.

At the end of this class students will be ready to work on research in the area of computer architecture. Moreover they will have gained practical experience in using architectural design tools, such as architecture simulators, area/complexity estimators and power/energy estimators, to design processors at the architectural level.

Besides attending two lectures and one discussion session per week students will complete six homework and two simulation projects.

## **2. Textbooks**

1. Dubois, Annavaram and Stenström: “Parallel Computer Organization and Design” Cambridge University Press, 2012. ISBN: 978-0-521-88675-8. Purchase from the USC bookstore or from Amazon.com. REQUIRED.
2. Presentation slides. Purchase from the USC bookstore. REQUIRED.

## **3. Prerequisites:**

1. EE457: Computer System Organization. (Either take it at USC or take the EE457 placement exam.)
2. Logic design and assembly/machine code background are also required.

## **4. Meeting times**

- Class meetings: MW 9:30-10:50 OHE100D
- Discussion: F 11-11:50 OHE120

## **5. Discussion session and attendance:**

EE-557 has two regular lectures of 80 minutes each and a 50 minutes discussion session per week, over 15 weeks. The discussion session is an opportunity to discuss the material covered in class,

the homework and the exams with the TA. At times class material may be expounded during the discussion session. Attendance is not taken but attending the class and the discussion session is part of the course requirements. There will be 5% of the grade dedicated to class attendance and participation for students on campus (not applicable to students registered in DEN Section 30628D).

All material/information given out during regular class times and discussion sessions is part of the course. If you have to miss a class or a discussion session, make sure that you catch up by asking a friend to brief you up. Also stay informed of homework deadlines, changes of deadlines, potential problems with homework questions, information on exams, etc., by visiting the ee557 DEN blackboard regularly.

## 6. TAs

TBA

## 7. Course work:

1. Homework: There will be 6 homework. Homework are assigned electronically through the DEN blackboard on a Tuesday. Homework are due two weeks from assignment, on a Tuesday before 5pm PST. We use paperless homework submission, grading and return. Homework are submitted electronically on the DEN blackboard. Homework must be in PDF (scan it if you want). Homework will be graded electronically and returned through the DEN blackboard. Late homework will be accepted through electronic submission until the following Thursday at 5pm PST. The penalty is 25% of the maximum grade if submitted by 5pm on Wednesday and 50% of the maximum grade if submitted by 5pm on Thursday. No homework will be accepted after that. **THIS PROCEDURE APPLIES TO BOTH DEN AND NON-DEN STUDENTS.**
2. Simulation assignments: There will be two simulation assignments. These assignments do require to use design tools under Unix but otherwise require very little or no programming. The goal of the first project is to familiarize you with the tools. The second project is a microarchitecture design project using the tools. The submission and grading of projects follow the same procedure as for homework.
3. Midterm: W 10/24 9:30-10:50pm
4. Final: M 10/17 11am-1pm

**Please understand that there will be NO make-up exam, except in cases of personal medical emergency certified by a physician, or of personal accident. Other requests will be denied.**

## 8. Grading Policy

Homework: 18%; Simulation projects: 12% (5% and 7%); Attendance/participation: 5%; Midterm: 25%; Final: 40%.

**There is no possibility to earn extra credit in this class. PLEASE DON'T ASK! The final grade will be computed as announced. There is already a lot of work in this class! Do the best you can on each component of the course work you are graded on.**

## **9. Statement for Students with Disabilities**

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.-5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

## **10. Statement on Academic Integrity**

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles.

Scampus, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: <http://www.usc.edu/dept/publications/SCAMPUS/gov/>. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: <http://www.usc.edu/student-affairs/SJACS/>.

**IMPORTANT: ALL WORK IN THIS CLASS MUST BE DONE INDIVIDUALLY.**

## 11. Course Schedule:

Lecture	Date	Topic/Remarks	Assign date(Tuesday)	Due date(Tuesday)
Lect 1	8/27	Administration-Introduction		
Lect 2	8/29	Instruction sets/Static pipelines		
	9/3	LABOR DAY--no class	HWK1(on 9/4)	
Lect 3	9/5	Static pipelines		
Lect 4	9/10	Tomasulo		
Lect 5	9/12	Branch prediction--9/14: last day to drop w/o W		
Lect 6	9/17	Speculative execution	HWK2(on 9/18)	HWK1(on 9/18)
Lect 7	9/19	Speculative execution		
Lect 8	9/24	Register renaming/Speculative scheduling		
Lect 9	9/26	VLIW		
Lect 10	10/1	VLIW/Vector	HWK3(on 10/2)	HWK2(on 10/2)
Lect 11	10/3	Memory hierarchies/Caches		
Lect 12	10/8	Caches	Project 1(on 10/9)	
Lect 13	10/10	Virtual memory		
Lect 14	10/15	Virtual memory	HWK4(on 10/16)	HWK3(on 10/16)
Lect 15	10/17	Multiprocessors		
Lect 16	10/22	Multiprocessors		
Lect 17	10/24	MIDTERM 9:30-10:50am		
Lect 18	10/29	Multiprocessors	HWK5(on 10/30)	HWK4(on 10/30)
Lect 19	10/31	Interconnections		
Lect 20	11/5	Interconnections	Project 2(on 11/6)	Project 1(on 11/6)
Lect 21	11/7	Synchronization		
Lect 22	11/12	Coherence	HWK6(on 11/20)	HWK5(on 11/13)
Lect 23	11/14	Coherence--11/16: Last day to drop with W		
Lect 24	11/19	Consistency		
	11/21	THANKSGIVING RECESS--no class		
Lect 25	11/26	Consistency		HWK6(on 11/27)
Lect 26	11/28	Chip multiprocessors		
Lect 27	12/3	Chip multiprocessors		Project 2(on 12/4)
Lect 28	12/5	Course wrapup		
	12/7	END OF CLASSES		
	12/17	FINAL--11-1pm		