

# ECG700 Advanced Computer System Architecture

**Class meets: M/W 10:00-11:15am at TBE B-170**

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**Course Website:** <http://www.ee.unlv.edu/~meiyang/ecg700/ecg700.htm>

## Course Description

This course covers advanced topics in computer system architectures, including performance and technology trends, instruction-level parallelism, data-level parallelism, multiprocessors and thread-level parallelism, and memory hierarchy design. 3 credit hours.

## Textbook

Computer Architecture: A Quantitative Approach, J.L. Hennessy, D.A. Patterson, 5<sup>th</sup> Edition, Morgan Kaufmann Publishers, 2012.

## Recommended

Modern Processor Design, Fundamentals of Superscalar Processors, J.P Shen and M. Lipasti, 1<sup>st</sup> Edition, McGraw-Hill.

## Supplementary Materials

Class handouts & notes

## Topics

**Fundamentals of Quantitative Design and Analysis**

Classes of Computers, What is computer architecture, trends in technology, processor, power, and cost, Amdahl's law, metrics of performance

**Instruction Set Principles\***

Instruction set architectures, addressing modes, operands, control flow operations, role of compiler technology, encoding an instruction set

**Memory Hierarchy Design**

Memory hierarchy, cache performance, optimizations of cache performance, memory technology and optimizations, virtual memory and virtual machines

**Instruction-Level Parallelism and its Exploration**

Basic compiler techniques, branch prediction, static scheduling, dynamic scheduling, speculation, multiple issue, out-of-order execution, multithreading, limitations of ILP

**Thread-Level Parallelism**

Centralized shared-memory architectures, distributed shared-memory architectures, synchronization, memory consistency models, multicore processors

**Data-Level Parallelism**

Vector architecture, SIMD, GPU architecture, loop-level parallelism

## Evaluation

1. There will be one midterm exam and one final exam. Exams will be either take-homes or open-notes.
2. There will be 6 home assignments. In general, homework will be due two weeks from the date it is assigned, returned in two weeks from the due date. Late assignments will not be accepted. Staple your paper sheets together. Loose papers will not be accepted.
3. There will be one term project. Project may be individual or group-based (with two students). The project topics will be posted by the second week. Each group need turn in the project proposal by the fourth week, turn in the progress report in the eighth week, and turn in the final report and present in the 15<sup>th</sup> week. The final report should include an abstract, introduction, body, conclusion, and a list of reference. For each group, you need specify the tasks performed by each member. All members in one group will obtain the same grade for the project.
4. Distribution of final grade:

Homework	20%	(50 points)
Term project	30%	(75 points)
Exams (midterm and final)	50%	(125 points)

Grades may be determined according to this scale:

- A >= 220
- B >= 180
- C >= 150

## Attendance Policy

Attendance is required. You are responsible for all class work missed, regardless of the reason for the absence(s). And make sure you turn in the exam papers on time. It is your responsibility to check the course website for all activities going on with this course.

## Academic Dishonesty

Academic dishonesty includes, but is not limited to, activities such as cheating and plagiarism. Any work turned in for individual credit must be entirely the work of the student submitting the work. You may share ideas but submitting identical assignments (for example) will be considered cheating. For assignments, access to notes, the course textbooks, books and other publications is allowed. All work that is not your own, **MUST** be properly cited. This includes any material found on the Internet. **Any person caught cheating will be given an 'F' grade for the course and reported to appropriate university officials.**

## ADA statement

If you have a documented disability that may require assistance, you will need to contact the Disability Resource Center (DRC) for coordination in your academic accommodations. The DRC is located in the Reynolds Student Service Complex in room 137. Call at 895-0866 or TDD 895-0652, visit the DRC website at: <http://www.unlv.edu/studentlife/disability/>.