Course Description
EE 4379-Advanced Computer Architecture

2000-02 Catalog: Memory hierarchies, including cache and virtual memories. Parallel processing, including pipelining and multiprocessing, and parallel processing algorithms. Prerequisite: EE 4342 with a grade of "C" or better. EE 4342 may be taken concurrently with EE 4379.


Course Outcomes: Students completing EE 4379 will be able to:
1. Understand and apply concept and principle of cache memory and virtual memory to high-performance computer architecture (I).
2. Understand pipelining and its speed advantage and design pipelined logic (I).
3. Evaluate various multiprocessing configurations (I).
4. Design the overall organization of cache and virtual memories, and pipelined processors (I).
5. Demonstrate competence in oral technical communication (I).

Topics Covered:
1. Introduction and overview of computer structure (2 hrs.)
2. Memory hierarchy and cache memory (7 hrs.)
3. Memory management and virtual storage (8 hrs.)
4. Pipelined processor (11 hrs.)
5. Multi-processor configurations (3 hrs.)
6. Single-bus, multiple-bus and crossbar multi-processors (6 hrs.)
7. Interconnection networks (5 hrs.)

Class Schedule: Three hours lecture per week

Contribution to Professional Component: EE 4379 is a senior elective course in the computer area. It is one of a group of courses that can be taken by students seeking a specialization in computer engineering.
Relationship to Program Outcomes:

1. Have an ability to apply knowledge of mathematics, science and engineering principles.
   Students apply concepts and principles of cache memory, pipelining, and multiprocessing to high-performance computer design (Course Outcomes 1, 2, and 3).

2. Have an ability to design and conduct experiments and interpret data.
   Each student participates in design of pipelined logic and analysis of speed-up due to pipelining (Course Outcomes 1, 3, and 4).

3. Have an ability to design a system, component, or process to meet desired needs.
   A project is assigned to simulate different page/line replacement algorithms in virtual/cache memory (Course Outcomes 1 and 4).

7. Have an ability to communicate effectively.
   Students participate in in-class discussion of selected homework problems. Each student also writes a report for the project (Course Outcome 5).

9. Recognize the need for and have an ability to engage in life-long learning.
   Fast changing of computer architectures is emphasized in the class (Course Outcome 3).

10. Have a knowledge of contemporary issues.
    Students have homework problems that are related to modern processor architectures (Course Outcome 3).

12. Have a specialization in Computer Engineering.
    Contents of this course are related to the structure of modern computers (Course Outcomes 1-4).

Course Outcomes do not related to Program Outcomes 4-6, 8, and 11. They do correlate strongly with Educational Objective 1 (60%) and Educational Objective 2 (40%).

Computer Usage: Students use PCs to complete their simulation projects.

Prepared by: Yu-cheng Liu, Professor of ECE