COURSE DESCRIPTION

Department and Course Number: COMP 4300
Course Title: Computer Architecture
Total Credits: 3
Required: Yes (SWEN)
Prerequisites: COMP 3350
Class meetings per week: 3 hours
Lab meetings per week: 0 hours
Course Coordinator: Dr. Richard Chapman
Date Prepared: February 17, 2004

Current Catalog Description:
Comparison of computer architectures, emphasizing the relationships between system software and hardware. Includes processor control and data path organization, memory subsystem design, instruction set design, processor simulation, and quantitative analysis of computer performance.

Textbooks:

References:

Course Objectives:
1. Be proficient in the design of modern computer systems at the architectural level.
2. Be able to quantitatively analyze the impact of design trade-offs on system performance.
3. Be able to develop software that utilizes the underlying architecture efficiently.

Prerequisites by Topic:
1. Computer organization and assembly programming
2. Data representation
3. Digital logic

Topics Covered: (specify number of hours on each)
1. Introduction to computer architecture, issues in computer design (3 hours)
2. Cost and performance measurement (3 hours)
3. Control logic and datapath (3 hours)
4. Instruction sets, instruction decoders (3 hours)
5. Von Neumann bottleneck, memory hierarchy introduced (3 hours)
6. Pipelining, arithmetic logic units, effective address computation (6 hours)
7. Instruction level parallelism, superscalar and VLIW processors (6 hours)
8. Memory hierarchy revisited, caches, virtual memory (6 hours)
9. Storage systems (3 hours)
10. Lessons in VHDL, throughout semester (6 hours)
11. Review and exams (3 hours)

Laboratory Projects: (specify number of weeks on each)
1. Getting started in VHDL – Implementing a full adder (2 weeks)
2. MIPS Part 1 – datapath (3 weeks)
3. MIPS Part 2 – controller (3 weeks)
4. MIPS Part 3 – putting it all together (3 weeks)

Oral and Written Communications:
All students are required to apply documentation skills as part of the course design projects.

Social and Ethical Issues:
None.

Theoretical Content:
None.

Problem Analysis and Solution Design:
Fundamentals of computer architecture trade-offs are presented in focused lessons (3 hours) and then applied as appropriate throughout the course. All students apply fundamental software engineering practices to analyze, design, implement, test, and document solutions to all programming assignments. Students apply the analysis and design skills already acquired to the development of software components, subsystems, and systems in VHDL. Each assignment has stated requirements and students are responsible for applying a controlled, iterative process for development.