SYLLABUS

Computer Science 270

Spring 2004

Computer Architecture & Operations, II

Lectures: 3 Hours, 3 Credits
Tuesday & Thursday, 4:20 to 5:35 PM
Kaufmann Hall 224
Instructor C. E. Grosch

Text:
Computer Organization & Design; The Hardware/Software Interface, 2nd Ed.

General Description of the Course
This course is the second course in a two semester sequence; CS 170/270. It is designed
to present the basics of the arithmetic/logic unit, memory system, processor imple-
mentation and control, and pipelining. Throughout this course I will be emphasizing
the importance of performance and the strong connection between the hardware and
software. In this second course, CS 270, I assume that you have taken (and passed)
CS 170. This means that I will assume that you know all of the material which was
covered in CS 170.

Text and Outline of the Course Material
The same textbook is used in both CS 170 and CS 270 so, if you have taken CS170,
you should have the text for CS270. It is important that you read and study the text.
Generally, it will be helpful to you if you “skim” the chapter before I begin discussing
the material in it; this will give you an overview. After my lectures you should read
the relevant chapter in depth. You are responsible for all of the material in each of
the chapters listed above unless I specifically state otherwise.

I encourage you to ask questions in class and/or to come to my office with your
questions. If you don’t ask questions I will assume that you understand all of the
material completely.
The material to be covered in this course and the corresponding chapters of the text are:

1. Overview; overall structure of a computer.

2. Chapter 4: The design and operation of an ALU (Arithmetic/Logic Unit); this includes computer arithmetic, algorithms and hardware for addition, subtraction, multiplication, division and logical operations as well as building an ALU.

3. Chapter 7 & Appendix B: The technology and operation of the memory hierarchy (cache-RAM-disk) as well as virtual memory; this includes basic technology, caches, the cache-RAM interaction, the virtual memory system, memory system performance.

4. Chapter 5: Implementing and controlling a processor; this includes basics, the Fetch/Execute cycle, implementation of a subset of the arithmetic, logic, load/store and branch instructions in a single cycle machine, a multicycle implementation of these instructions, the basics of microprogramming.

5. Chapter 6: Pipelining the processor; this includes an overview, details of a pipelined processor, control of a pipeline, pipeline hazards, detecting and removing them.

Supplemental Material & Glossary

In addition to the text I will use handout material which will be given to you in class throughout the semester. The text contains a Glossary of terms in Appendix G. At the end of each chapter there is a list of the key terms introduced in that chapter; these are defined in the Glossary. You should read the list of key terms and, if you are in any doubt as to their meaning, look them up in the Glossary.

Homework Assignments

There will be 6 homework assignments. These are:

1. Problems 4.1, 4.2, 4.3, 4.4, 4.5, 4.6; also A = 10111 and B = 00110 are two’s complement binary numbers, find (1) A + B, (2) A – B, (3) A × B using Booth’s algorithm and (4) A ÷ B.

2. Problems 4.14, 4.25, 4.26, 4.27 and 4.44.

3. Problems 7.7, 7.8, 7.9, 7.11, 7.15, 7.16, 7.17, 7.18 and 7.19.

4. Problems 7.20, 7.21, 7.22, 7.27, 7.32, 7.33, 7.34, 7.35 and 7.36.


Each of these homework assignments will be collected and graded on a range of 0 to 10. I will announce, in class, when each assignment is due. In general, homework problems assigned in week N will be due in class on the same day of week N + 1. Unless you have an excellent excuse, which is given to me in writing, you will lose 1 point for each day for which the homework is late. You should keep copies of the homework which you hand in. Solutions for the homework will handed out when the homework is returned. If you have trouble understanding what is being asked for in a homework assignment you may ask me in class, call me at my office, send me an email or by make an appointment.

Tests, Final and Grades

The tests dates will be: Test 1, Thursday, 12 February; Test 2, Thursday, 25 March. A solution for each test will handed out when the test is returned.

Tuesday, 27 April is the last day of class.

The Final Examination will be Thursday, 29 April in Kaufmann 224 from 3:45 to 6:45PM.

Your grade will be based on a total of 100 points. The homework will count for 20 points. There will be two tests and each will count for 20 points for a total of 40 points. The final examination will be comprehensive and will count for 40 points. The tests and final will be open book and notes.

Holidays

There will be no classes during the week of 8 March (Spring Break).

Office Hours

My office hours will be: Monday & Friday from 10:00AM to 1:00PM in my office in Crittenton Hall and on Tuesday from 3:00PM to 4:15PM, in my office in the Education Building. You may also see me by appointment. I spend every Wednesday at NASA Langley and am, therefore, not available. You may send me email (grosch@cs.odu.edu or enright@ccpo.odu.edu). My telephone numbers are: 683-4585 (Education building) and 683-4931 (Crittenton hall). You may leave messages, papers, etc. for me at the CS Department Office. The Department staff will send me email and/or put material in my mail box.

DO NOT PUT MESSAGES OR PAPERS UNDER MY OFFICE DOOR!