

# Principles of Customized VLSI Design

Spring 1998  
CS 45111 / 55111

## Instructor

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MSB 351, 672-4004 ext. 351  
Office hours = Tu 1-3pm, Th 1-3pm, or by appt.

## Teaching Assistant

none

## Course Prerequisites

The 1997-1998 Graduate Schools Catalog lists the prerequisites for this course as CS 4/5101 Computer Organization and Architecture; equivalent courses taken elsewhere are also acceptable. It would be helpful if you have at least a slight background in logic design, although that background is not strictly necessary.

## Course Overview

The goal of this course is to provide a “computer science”-oriented introduction to VLSI design.

In a computer engineering program, students might take a semester or two of logic design at the sophomore level, followed by several senior- or graduate-level courses on the internals of a VLSI chip, the use of Computer-Aided Design (CAD) tools, and the algorithms employed by those tools. Furthermore, those courses would be supplemented by additional courses in circuit design, electronics, quantum physics, and computer architecture.

Since we do not have 5-10 semesters of work time available to us in this course, or the benefit of a computer engineering background, this course will concentrate on providing an overview of the VLSI design process, practical training using CAD tools for the design of digital circuits using Field-Programmable Logic Devices (FPLDs), and some understanding of the major CAD algorithms.

## Textbook

Several textbooks will be used in this course.

The first textbook is optional, primarily due to the fact that it will only be used in a couple of lectures:

- *Workview Office Student Edition*, Duckworth, Prentice Hall, 1997.

This textbook is primarily a lab manual — it shows you how to use CAD tools for schematic capture and simulation. Although you will need to read this textbook to prepare for your first project, you may want to share a copy with other students, or simply to read the copy that is available in the “Distributed Operating Systems and VLSI Design Laboratory” (MSB 353) (for use **only** in that lab). A copy of the Viewlogic Workview Office software will be installed on one or more PCs in the VLSI Design Laboratory; students wanting their own copy of the software (included on a CDROM at the end of the book) should purchase the text.

The second textbook is required, and will be used for over half of the course:

- *Digital Systems Design and Prototyping Using Field Programmable Logic*, Salcic and Smailagic, Kluwer Academic Publishers, 1997.

You will also need to read this textbook to prepare for your final project. A copy of the Altera Max+PLUS II software will be installed on the HP workstation “vlsi.mcs.kent.edu” and on one or more

PCs in the VLSI Design Laboratory; students wanting their own copy of the software (included on a CDROM at the end of the book) should purchase the text.

The third and final textbook is not required, but I will use it for several lectures at the beginning and end of the course:

- *Application-Specific Integrated Circuits*, Smith, Addison-Wesley, 1997.

Normally, I would not point out that this book exists, as I often use a variety of additional textbooks in preparing my lectures, and I would be afraid that, by listing those additional books on my syllabus, some students might think that I was somehow suggesting that they should buy those books as well.

In this case, however, I will make an exception because Prof. Smith has very generously put *the entire contents* of this textbook online in html format. According, when I cover material from this book, you might want to read the online version of that material as well:

- <http://spectra.eng.hawaii.edu/~msmith/ASICs/HTML/ASICs.htm>

## Class Web Page

The web page for this class is <http://www.mcs.kent.edu/~walker/vlsi.s98> (links to this page, and to my other classes, are all available on my home page). The web page will contain links to the following course materials:

- Current class syllabus and schedule
- Lecture notes (in PostScript, printed 4-up)
- VLSI design project assignments

Other information may be included as well. You might want to check the web page on a regular basis, in particular when a project is outstanding.

## Lectures

Students are expected to attend each lecture. I will not take roll, and I understand that it may occasionally be necessary to miss a class, but in general I expect you to attend each lecture

At each class, I will hand out one sheet of paper containing reduced copies of *at most eight* of my slides for that lecture. If you would like to have reduced copies of *all* of my slides for that lecture, the full version of the lecture notes will be on the class web page before the lecture, and you can print them out. Note that you are not required to either look at or print out these notes; they are provided solely for your convenience should you want them. However, you should *not* consider skimming these notes to be an adequate substitute for attending the lecture, as they will contain only the text of my slides, not the comments that I will make in class.

My lecture notes will be drawn from a variety of sources. The textbooks listed above will serve as a primary reference, although some material will be drawn from other books on logic design, CAD, VLSI design, etc. I may also use lecture notes from other professors as a reference.

## VLSI Design Projects

There will be 2 VLSI design projects during the semester. The first will be a paper design using the Viewlogic Workview Office tools, and the second will be a FPGA-based design using the Altera Max+Plus II tools. Tentative due dates are shown on the Class Schedule, attached at the end of this syllabus.

## Late Policies

In general, you will have adequate time to complete each assignment. However, you should begin work on each assignment early so that you will have plenty of time to become familiar with it and with the CAD tools that you will be using, and so that you will have time to “sleep on” the difficult parts. Waiting until two days before the due date to start the project is a bad idea.

