Syllabus: CPE/EE 427, CPE 527
VLSI Design I, Fall 2006

**Instructor:** Dr. Aleksandar Milenkovic  
Email: milenka@ece.uah.edu  
Office: 217-L  
Phone: (256) 824 6830

**Office Hours:** Monday 5:30 – 6:30 PM, Wednesday 1:00 – 2:00 PM

**Laboratory Assistant:** Mr. Joel Wilder  
Email: wilderj@ece.uah.edu  
Phone: (256) 824 3484  
Office: EB 242-C

**Office hours:** TBD

**Time and Place:** Lectures: MW 3:55 PM - 5:15 PM, Engineering Building 239

**Web Page:** http://www.ece.uah.edu/~milenka/cpe527-06F/

**Textbook:** Neil H.E. Weste, David Harris,  
CMOS VLSI Design: A Circuits and System Perspective, Addison Wesley,  

**Reference Text(s):**
1) J. Rabaey, A. Chandarakasan, B. Nikolic,  
*Digital Integrated Circuits: A Design Perspective*  
2) Michael John Sebastian Smith, *Application-Specific Integrated Circuits*,  

**Prerequisites:** EE 202 Introduction to Digital Logic Design,  
EE 315 Introduction to Electronic Analysis and Design

**Course Description:** The course gives an introduction to digital integrated circuits.  
It covers the following topics. CMOS devices and manufacturing technology.  
CMOS inverters and gates. Propagation delay, noise margins, and power  
dissipation. Sequential circuits, arithmetic, interconnect, and memories.  
Design methodologies. A major part of the course will be a design project.

**Tentative Schedule:**

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>W1.</td>
<td>Introduction into Digital Integrated Circuits, Manufacturing</td>
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<tr>
<td>W2.</td>
<td>The devices: transistors, resistors, parasitic capacitance</td>
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<td>W3.</td>
<td>CMOS Inverter</td>
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<td>W4.</td>
<td>CMOS Logic, Pass Logic</td>
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<td>W6.</td>
<td>Dynamic view</td>
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<td>W7.</td>
<td>Design for speed, power</td>
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<tr>
<td>W8.</td>
<td>Sequential Logic Cells, Sequential Logic and Gating</td>
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<tr>
<td>W11.</td>
<td>Alternative design styles (dynamic, domino, pseudo nMOS)</td>
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<tr>
<td>W12.</td>
<td>Datapath elements (Adders &amp; Multipliers, Shifters)</td>
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<tr>
<td>W14.</td>
<td>Class Presentations</td>
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*I reserve the right to change the above schedule based upon the needs of the course.*
**Grading Policy:**

Final course grades will be determined in the manner outlined below:

1. Lab Assignments  15%
2. Homeworks  15%
3. Test I   20%
4. Test II   20%
5. Project  25%
6. Class Participation  5%

**Lab Assignments**

The lab assignments serve two purposes. First, they allow the students to apply what is taught during lectures. After completing all lab assignments the students will have the skills required to complete the main purpose of the lab – the final project. During the first semester the students will design and verify a VLSI circuit using the Cadence / Mentor Graphics CAD tools.

**Preliminary Project Info**

The projects will be done in groups of 2-3 undergraduate (2 graduate) students on the SUN workstations in EB246/216. Project topics are the choice of each design team with the approval of the instructor. Some possible topics include a game; a digital multiply/accumulate/shift unit for a digital filter; an ALU for a CPU; a single chip computer with a limited instruction set; a state machine based score board controller, car/house alarm system; or a shift-register based multiplier. The project will be designed using the CAD tools covered in the lab assignments.

**Tentative Schedule of Important Class Dates**

- October 11: Test I.
- November 20: Test II.
- November 29, December 05: Project oral presentations.
- December 13: Project written reports due (3:00 PM).

I reserve the right to change the above schedule based upon the needs of the course.

**Academic Policies:**

See course web site: [http://www.ece.uah.edu/~milenka/cpe527-06F/#Info](http://www.ece.uah.edu/~milenka/cpe527-06F/#Info)