**ECE 424 Introduction to VLSI Design**

*Cankaya University, ECE Department*

|  |  |
| --- | --- |
| Term: | Fall 2014 |
| Weekly Hours: | 15:20-17:10 (M) & 16:20-17:10 (T) |
| Website: | ece424.cankaya.edu.tr |
| Instructor: | Dr. Emre Yengel |
| Room: | L106 |
| Email: | e.yengel@cankaya.edu.tr |

 **Tentative Course Content:**

1. Introduction to VLSI Technology: Historical Perspective, Overview of VLSI Design Methodologies, Design Hierarchy, CAD Technology
2. CMOS Fabrication and Layout: Fabrication process flow, Layout design rules
3. MOS Transistor: Structure and Operation of MOS transistor, MOSFET current characteristics, MOSFET capacitance
4. MOS Inverters: NMOS Inverters with different loads, CMOS inverter
5. MOS inverter switching characteristics: Delay time definition, Power and Energy dissipation
6. CMOS Combinational Logic Gates: Design Parameters , DC Characteristics, Complex CMOS Combinational Logic Gates, Transmission Gates
7. Standard Cell Layout Methodology; Examples of Layout design for combinational logic gates, Euler Path Method, Stick Diagram, Examples of Stick Diagram
8. Sequential MOS Logic Circuits: Flip-Flops, Latches
9. Special Purpose Logic Gates: Schmidt-Trigger, Counters, Registers
10. Memory Circuits
11. System Design Parameters; Timing Issue, Wiring

**Assesment:**

|  |  |
| --- | --- |
| Attendence | : %10 |
| Homeworks | : %15 |
| Lab.  | : %20 |
| Midterm | : %25 |
| Final  | : %30 |

**Tentative Lab Content:**

1. Introduction to PSPICE
2. NMOS Logic Circuits
3. CMOS Logic Circuits
4. Combinational Logic Design
5. Introduction to VHDL Programming
6. Multiplexers,Decoders and Encoders in VHDL
7. Flip-Flops and Binary Counters in VHDL
8. Clock Division and Mealy/Moore Type Machines
9. How to Program FPGA Cards
10. Project

**Recommended Text Book:**

Digital Integrated Circuits (2nd ed.) ,Jan Rabaey, Anantha Chandrakasan, Borivoje Nikolic (2003), ISBN-13: 978-0130909961

**Additional Text Books:**

* CMOS Circuit Design, Layout, and Simulation (2nd ed.) , R. Jacob Baker (2004), ISBN: 978-0471700555
* Microelectronics Circuit Analysis and Design (4nd ed.), Donald Neamen (2009), ISBN: 978-0073380643
* [CMOS VLSI Design: A Circuits and Systems Perspective](http://www.amazon.com/CMOS-VLSI-Design-Circuits-Perspective/dp/0321547748/ref%3Dsr_1_3?ie=UTF8&qid=1348490291&sr=8-3&keywords=digital+integrated+circuits) (4th ed.), Neil Weste, David Harris (2010), ISBN: 978-0321547743