

ECE 1387 - CAD for Digital Circuit Synthesis and Layout

January 2010

J. Anderson

- Instructor:** Jason Anderson
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Office Hours: After class or by appointment (send e-mail or phone)
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- Pre-requisites:** ECE 1388 (VLSI Design Methodology), or ECE 451 (VLSI Systems), or CSC 2410 (Algorithms in Graph Theory), or Permission of instructor.
Programming skills in C, including data structures.
- Lecture:** Wednesdays noon – 2 PM in room BA 4164 (Bahen Building)
- Papers/Readings:** Available in PDF on course website.
- Reference Texts:** **EDA for IC Implementation, Circuit Design, and Process Technology**, L. Scheffer, L. Lavagno, G. Marin (editors), CRC Press, 2006 (not mandatory).
- Evaluation:**
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|-------------|--------------|---------------------|-----|
| Assignments | 50% (3 or 4) | Paper | 25% |
| Exercises | 10% (2 or 3) | Class Participation | 10% |
| Scribe Work | 5% | | |
- Assignments:** Programming implementations of CAD problems such as placement, routing, and technology mapping using optimization strategies such as simulated annealing, dynamic programming, integer linear programming (ILP), and branch and bound, and illustrated using computer graphics.
- Exercises:** Hands-on experience with CAD tools such as ABC (UC Berkeley), VPR (Auto Place & Route), and hMetis (Partitioning).
- The Paper:** A critical assessment of work in a subset of the field (chosen in consultation with the instructor) based on 3 to 4 papers.
- Participation:** It is the expectation that you will contribute one good question or idea per class to the general discussion. Hopefully more!
- Scribe Work:** Lectures will be delivered using the black board. You will be responsible for creating an electronic version of the notes for one of the lectures, including all text and figures.

TENTATIVE Lecture and Assignment Schedule

#	Date Lecture	Lecture Topic	Assignment/ Exercise Handed Out	Assignment/ Exercise Due
1	Jan 13	Introduction, Overview	Paper	
	Jan 20	NO CLASS		
2	Jan 27	Detailed Routing	Assignment 1 – FPGA Maze Router	
3	Feb 3	Timing-Driven Routing		
4	Feb 10	Placement		
	Feb 17	NO CLASS – READING WEEK	Exercise 1 – VPR Placement and Routing	Assignment 1
5	Feb 24	Placement (Simulated Annealing)		
6	March 3	Placement (Analytical Techniques)	Assignment 2 – Analytical Placement	Exercise 1
7	March 10	Timing Analysis and Slack Allocation		
8	March 17	Partitioning (Branch and Bound)	Assignment 3 – Partitioning Using B&B	Assignment 2
9	March 24	Partitioning (FM/Multi-Level: hMetis)	Exercise 2 – Partitioning Using hMetis	
10	March 31	Technology Mapping (Dynamic Programming)	Assignment 4 – Technology Mapping Using Dynamic Prog in ABC (UC Berkeley)	Assignment 3
11	April 7	Floorplanning via Sequence Pair OR Physical Optimization via ILP	Exercise 3 – Floorplanning or Int Linear Programming (ILP)	Exercise 2
12	April 14	Special Guest Lecture; TOPIC: TBA		
	April 21			Exercise 3, Assignment 4
	April 28			Paper

NOTE: You must consult with the instructor on your paper topic by mid-March.