Physical Design for Nanometer ICs

Time/Location/Course#: Thursdays 2:20–5:30pm; BL-114; EEE5026; #943/U0280.
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Teaching Assistant: Yu-Sheng Lu (yslu@eda.ee.ntu.edu.tw); BL-406; (Tel) 3366-3700 ext. 6406; Office hours: Wednesdays 12:30–1:30pm.
Prerequisites: data structures, algorithms, and logic design.
Required Text: You may choose either of the following two books:


References: Selected reading materials from recent publications (see the course web site).
Course Contents:

- Introduction to VLSI design flow/styles and technology roadmap
- Physical design processes: partitioning, floorplanning, placement, routing (global, detailed routing), clock and power/ground routing, post-layout optimization
- Timing: timing modeling, performance-driven optimization
- Signal/power integrity: crosstalk, IR drop
- Design for manufacturability: process variation, optical proximity correction (OPC), chemical mechanical polishing (CMP), multiple patterning, electron beam, extreme ultraviolet (EUV), directed self-assembly (DSA), etc.
- Design for reliability: antenna effects, redundant via, electromigration, thermal issue, etc.
- Machine learning based layout optimization.

Grading Policy:

- Homework assignments + quizzes (on the homework due dates): 25%
- Programming assignments + lab: 25% (all submissions will be subject to duplication checking; those with ≥ 40% similarity will be penalized)
- One in-class open-book, open-note final exam: 30% (June 28)
- A final project due + presentation + demo: 20% (June 21). A 1-page project proposal is due on May 24.
- Plus, bonus for class participation

**Attention:** *The grades on homework/programming assignments and the test are considered final two weeks after they have been handed back, so you should bring any questions to the grader’s attention promptly.*

**Default project:** See [http://iccad-contest.org/tw/](http://iccad-contest.org/tw/) for Problems B, C, and E of the 2018 International CAD Contest at ICCAD. (Problem E is for domestic undergraduate students.)

- Problem B: Obstacle-Aware On-Track Bus Routing
- Problem C: Timing-Aware Fill Insertion
- Problem E: Color-aware Routing for Double Patterning

**Homework:** Students may discuss the homework problems with one another but must write up their solutions separately. Homework must be handed in at the beginning of the class on which it is due in order to avoid a late penalty. Late homeworks will incur a penalty of 30 percent of the total score per day for the first four days (Saturdays and Sundays included) and will not be accepted afterwards.

**On-Line Resources:** Lecture notes, homeworks/tests, sample solutions, grading information, and other course-related materials are available at [http://cc.ee.ntu.edu.tw/~ywchang/Courses/PD/pd.html](http://cc.ee.ntu.edu.tw/~ywchang/Courses/PD/pd.html).

**Academic Honesty:** Cheating is very uncivilized behavior and is to be avoided at all cost. Oral discussion about homeworks is not considered cheating. Copying someone else’s homework/test or part of an homework/test is cheating. If cheating is discovered, all students involved will receive no credit for the homework/test, possibly an F grade for the course.