ESE 556: VLSI Physical and Logic Design Automation
Fall Semester 2017

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Schedule: MWF 8 – 8.53AM, Frey Hall 217.

Office hours: Monday, Wednesday: 1-2.45PM

Goals: Upon completion of the course, students will know to design and implement *state-of the-art* CAD tools and algorithms for VLSI logic and physical level design. The discussed topics include physical (layout-level) specific tasks such as circuit partitioning, floorplanning, module placement, and signal routing. Automated optimization of combinational and sequential circuits will be also presented. The course involves three comprehensive project assignments.

Textbooks:

1) N. Sherwani, "*Algorithms for VLSI Physical Design Automation*", Kluwer, 1999.
2) G. Hachtel, F. Somenzi, "*Logic Synthesis and Verification Algorithms*", Kluwer, 1996.
3) Giovanni De Micheli, "*Synthesis and Optimization of Digital Circuits*", Mc-Graw Hill, 1994.

Prerequisites:

B.S. in Computer Engineering/Science or Electrical Engineering

Topics:

1) *Physical Design Automation*:

- Introduction to Design Automation and CAD Tools
- Basic Data Structures and Algorithms
- Logic and Circuit Partitioning
- Floorplanning and Placement
- Global and Detailed Routing

2) *Logic Design Automation*:

- Two-Level Combinational Logic Optimization
- Multiple-Level Logic Optimization
- Sequential Logic Optimization
- Cell-Library Binding
- Integrated Logic and Physical Design Automation

Assignment Schedule and Grading:

Project 1 (*Physical Design Automation*: Partitioning, Floorplanning)	30%
Project 2 (*Physical Design Automation*: Placement, Routing)	40%
Project 3 (*Logic Design Automation*: Library Binding, Two/Multiple Level Logic Minimization)	30%

The project work is organized in groups of two students. Project requirements include preparing a formal project report and presentation of the project work.

Program Outcomes and Assessment **% contribution***

On the following " a-k" list, please check those topics which are covered within the course:

X❑ (a) ability to apply knowledge of math, engineering, and science	
(a1) knowledge of probability and statistics, including applications to EE/CE	0%
(a2) knowledge of mathematics and of basic engineering sciences necessary to carry out analysis and design appropriate to EE/CE.	5%
(a3) knowledge of discrete mathematics or advanced mathematics (linear algebra)	0%
X❑ (b1) ability to design and conduct experiments	25%
X❑ (b2) ability to analyze and interpret data	10%
X❑ (c) ability to design system, component or process to meet needs	25%
❑ (d) ability to function on multi-disciplinary teams	
X❑ (e) ability to identify, formulate, and solve engineering problems	10%
X❑ (f) understanding of professional and ethical responsibility	5%
X❑ (g) ability to communicate effectively	10%
❑ (h) broad education	
❑ (i) recognition of need an ability to engage in life-long learning	
❑ (j) knowledge of contemporary issues	
X❑ (k) ability to use techniques, skills, and tools in engineering practice	10%
❑ Any other outcomes and assessments?	

* Assume that the total contribution of any course will be 100%. Use the right hand column to indicate the approximate percent that the left hand columns contribute to the overall course.

Americans with Disabilities Act: If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC(Educational Communications Center) Building, Room 128, (631)632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.http://studentaffairs.stonybrook.edu/dss/index.shtml.

Academic Integrity: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

Critical Incident Management: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

Document Prepared by: Alex Doboli on 8/19/17