CSCE 5013: Design Automation of VLSI Circuits and Systems

Catalog Description:

This course studies physical design, analysis and optimization of VLSI circuits and systems with emphasis on computational realizations and optimization. We start with some related topics such as graph algorithms, and discuss various well-known algorithms and methodologies in the design process of VLSI circuits, including design partitioning, logic synthesis, floorplanning, routing, static timing analysis and performance-driven layout. It requires a basic knowledge of digital circuit design, data structure, and object-oriented programming.

Prerequisites:

CSCE 2114 Digital Design, CSCE 3193 Programming Paradigms

Textbook:

There is no required textbook for this course. Course notes for all lectures will be used. However, the following books are recommended:

- Practical Problems in VLSI Physical Design Automation, Sung Kyu Lim, Springer, 2008, ISBN 978-1402066269
- VLSI Physical Design Automation: Theory and Practice, Sadiq M. Sait and Habib Youssef, World Scientific, 1999, ISBN 978-9810238834

Course Objective:

The objective of this course is to study algorithms and methodologies to solve practical problems in computer-aided VLSI design. We shall discuss how to transform a circuit from a structural to a gate-level representation, and finally into layout and masks. Because of design complexity, such transformation needs to be efficiently carried out using computers so that the resulting layout satisfies topological, geometric, timing, power and manufacturability constraints. Students will also learn to compare the complexity and efficiency of various algorithms for physical design, analysis and optimization, and can implement such algorithms with a programing practice.

Topics Covered:

- Introduction to computer-aided design
- Design partition
- Floorplanning
- Placement
- Routing
- Static timing analysis
- Interconnect optimization

Class Schedule:

Meets either 3 times a week for 50 minutes or 2 times a week for 1 hour 20 minutes for 15 weeks.

Course Website:

You must check these websites on a regular basis for most up-to-date information!

- Main Website:
  - Including course materials, grades, and reports
  - https://e3da.csce.uark.edu/teaching/CSCE5013
- Blackboard:
  - Used for announcement and assignment submission
  - Make sure to turn on email notifications
  - https://learn.uark.edu/
- Piazza Q&A Forum:
  - Used for FAQs and student discussion
  - https://piazza.com/class/CSCE5013

Homework Assignments and Project:

Homework will be assigned. Optional final project can be used to substitute the final exam.

Grading:

Attendance and Participation: 10%
Homework or Lab Assignments: 30%
Three Midterm Exams: 30%
Final Project: 30%
Potential Bonus: Up to 5%

Grading will be regularly updated on the course website. It's your responsibility to check and report if the posted grades are incorrect.

Only exam grades may be curved. We will use the following scale to assign final grades:

A: [90, 100] B: [80, 90), C: [70, 80), D: [60, 70), F: below 60%

Absences:

You must notify the instructor via email if you are not able to attend a test or will be late with an assignment. You are to notify the instructor **before** the test or assignment due date if at all possible. Excused absences are allowed with a **written** record for illness, death of a family member, and other reasonable emergencies.

Academic Honesty:

As a core part of its mission, the University of Arkansas provides students with the opportunity to further their educational goals through programs of study and research in an environment that promotes freedom of inquiry and academic responsibility. Accomplishing this mission is only possible when intellectual honesty and individual integrity prevail.

Each University of Arkansas student is required to be familiar with and abide by the University's 'Academic Integrity Policy' which may be found at honesty.uark.edu/policy. Students with questions about how these policies apply to a particular course or assignment should immediately contact their instructor.

Emergency Preparedness:

Many types of emergencies can occur on campus; instructions for specific emergencies such as severe weather, active shooter, or fire can be found at emergency.uark.edu. The University of Arkansas has a campus-wide alert system for any hazardous conditions that may arise on campus. To learn more and to sign up: http://safety.uark.edu/emergency-preparedness/emergency-notification-system/

Inclement Weather:

If the university is officially closed, class will not be held. When the university is open, you are expected to make a reasonable effort to attend class, but not if you do not feel that you can get to campus safely. Any changes to due dates or the class schedule will be communicated via email to your uark email address.

Academic Support:

University of Arkansas Academic Policy Series 1520.10 requires that students with disabilities are provided reasonable accommodations to ensure their equal access to course content. If you have a documented disability and require accommodations, please contact me privately at the beginning of the semester to make arrangements for necessary classroom adjustments. Please note, you must first verify your eligibility for these through the Center for Educational Access (contact 479–575–3104 or visit http://cea.uark.edu for more information on registration procedures).