CIS 4930 Testing & Fault Tolerance in Digital Systems

Instructor:	Dr. Hao Zheng
Office Location:	ENB 312
Email:	haozheng@usf.edu
Phone/Fax:	$(813)974 - 4757$, $(813)974 - 5456$
Class Meeting Time/Location:	MW $12:30 - 1:45pm$ at CIS 1047.
Credit Hours:	3
Office Hour:	$2:30 - 4pm$, Mon. & Wed. or by appointment

Course Description

In the design cycle of a VLSI complexity integrated circuit (IC), the post-fabrication testing phase follows the design phase. Testing is an important phase during which our goal is to ensure that the circuit behaves the way it is expected to behave. A suite of test vectors and associated expected responses are used to test the IC. Though it looks like testing should be worried about post-fabrication, the designer, in fact, must ensure the circuit testability during the design phase rather than an after-thought. In this course, you will learn the entire gamut of digital system testing issues and solutions, namely, fault modeling, fault detection, development of test-suites, automation of test vector generation, etc.

Course Outcomes   By completing this course, you will

1. Gain a deep understanding of IC testing problem;
2. Be able to analyze a given logic-level circuit for fault coverage;
3. Be able to design and implement automatic test generation algorithms; and
4. Gain knowledge on design-for-testability methods.

Prerequisites   The catalog prerequisites are COP 4530 and CDA 3201. However, the solid background in the following courses is also highly desirable.

- COT 4400 Analysis of Algorithms or equivalent course.
- CDA 4213 CMOS VLSI Design or equivalent course.
- Proficient in writing code in C/C++ or any other high level language.

Required Textbook   *Digital Systems Testing and Testable Design*, M. Abramovici, M. A. Breuer, and A. D. Friedman, 1995, ISBN 978-0-7803-1062-9, Wiley Inter-Science.
        Can be accessed for free online via USF library.

Attendance   Required.

Last Day to Drop with 'W'   March 23rd, 2019.

Evaluation

Homework/Exams	Weight	Date
Homework	20%	TBA
Exam 1	25%	Around 6th week
Exam 2	25%	Around 13th week
Final Project	30%	Starts after the Spring break

Note: The exact dates for the exams may change.

Final Grading Scale   Suppose your final grade percentage is x. The following table defines the mapping from x to a letter grade.

$x < 60\%$	$60\% \leq x < 70\%$	$70\% \leq x < 80\%$	$80\% \leq x < 90\%$	$x \geq 90\%$
F	**D**	**C**	**B**	**A**

- The instructor reserves the right to give +/- letter grades for the final grades.

Homework Assignments

- About 6 homework assignments will be given throughout this semester. All homework solutions must be submitted electronically through Canvas. Your solutions must be well structured and legible; otherwise, loss of credits may be incurred.

- All assignments are individual, and the final submission must be your own work.

- Late homework submissions will **NOT** be accepted.

- Requests for re-grading must be submitted via email or in writing **within one week since the graded assignment is returned**.

- Additional specific requirements may be imposed for individual assignments. Read carefully each homework description when it is distributed.

Final Project   You are required to implement some algorithms that are directly related to testing in C/C++ or Java. You can form teams with up to two members. More information about the requirements of the final project will be available later this semester.

Main Topics

The following is a tentative list of topics to be covered.

- Circuit modeling
- Fault modeling
- Fault simulation
- Testing for single stuck-at faults
- Testing for bridging faults
- Functional testing
- Design for testability
- Built-in self test
- System-level diagnosis
- Other contemporary testing issues

Course Communication

Canvas will be the major means for communications. Homework and project assignments, grades, announcements, and homework related materials will be posted only on Canvas. The following locations on Canvas will be used often during this semester.

- **Announcements** where all course related announcements are posted.
- **Assignments** where assignments are posted and your solutions are submitted. *Anything sent to anywhere else is ignored.*
- **Grades** where grades for assignments, exam(s), and the final project are posted.
- **Discussions** where questions and answers that are of interest to the entire class are posted.

Other course material, including lecture slides, will be posted on the webpage pointed by the link below.

http://www.cse.usf.edu/~haozheng/teach/psv

In addition, your email inbox needs to be cleared because messages broadcast to the whole class will be sent out via announcements and/or emails. *You are responsible for not receiving emails due to the overflow of your email inbox.*

Academic Integrity/Academic Dishonesty

Students are expected to be honest and not cheat on their assignments/examinations/project. Collaborations by forming study groups and having discussions with fellow students are highly encouraged, but copying each other's work is forbidden. You must write *your own solutions* in *your own words*. If you are unable to find the solutions to problems without step-by-step help from your study partners, you do not understand the solutions.

Every student should read the University's policies on student conduct, academic integrity, etc. Please see the University's Undergraduate Catalog regarding these policies at http://regulationspolicies.usf.edu/regulations/pdfs/regulation-usf3.027.pdf. Students caught cheating in any form will receive an **FF** grade for the course.

General Policies

- All announcements and assignments will be posted through Canvas. Students are required to check out Canvas regularly for course material and related information.

- Class Attendance is required although not actively monitored. Students are responsible for all information communicated during class. This information will not be necessarily duplicated in the class webpages.

- Academic dishonesty will not be tolerated and the student, in question, will be dealt with in accordance with the University policies.

- Electronic devices with communication functions may not be used as calculators, and they must be turned off at all times including exams and lectures.

- Students are not allowed to sell or distribute notes provided for this class.

- Students in need of academic accommodations for a disability may consult with the office of Students with Disabilities Services to arrange appropriate accommodations. Students are required to give reasonable notice to the instructor prior to requesting an accommodation. If accommodations are needed, a letter from the Office of Student Disability Services (SVC 1133) is required.

- Students who anticipate the necessity of being absent from class due to the observation of a major religious observance must provide notice of the date(s) in writing by the second class meeting.

- The instructor reserves the right to interpret the class policies if confusions may occur.