State University of New York - New Paltz
Department of Electrical and Computer Engineering

Course Title: Fault-Tolerant Design of Digital Systems **Course Number:** EGE534 **Credit:** 3 **Prerequisite:** Graduate Standing or Permission of instructor	**Instructor:** Dr. Baback Izadi **Office:** 102 Resnick Engineering Hall **Phone:** (845) 257-3823 **FAX:** (845) 257-3730 **Email:** bai@engr.newpaltz.edu **URL:** http://www.engr.newpaltz.edu/~bai
Meeting Days: Tuesday, and Friday **Meeting Time:** 12:15 AM - 1:30 PM **Meeting Room:** REH 111	**Office Hours:** Tuesday 10:00 AM – 12:00 PM Thursday 11:00 AM – 1:00 PM And by appointment

This course deals with designing and analyzing reliable digital systems. Various aspects of reliability in digital systems including fault tolerance, fault detection, diagnosis, and reconfiguration will be examined. The topics covered include faults and their manifestations, fault avoidance techniques, hardware redundancy, error detecting and correcting codes, time redundancy, software redundancy, reliability and availability analysis, Markov reliability modeling, system evaluation and performance reliability tradeoffs, real-time fault tolerance, and examples of practical systems.

Course Objective:
1. Students learn techniques for detection and correction of hardware errors in digital circuits and computer systems both at the IC production stage and during the operational life of the computer system.
2. Train the students in independent or team research and help them recognize the need for life-long learning through a term project.
3. Students improve their communication skills through term paper presentations.

Text (recommended):
1. *Design and Analysis of Fault-Tolerant Digital Systems,* B. W. Johnson: Addison-Wesley, 1989. ISBN 0-201-07570-9

References:
1. *Design and Analysis of Fault-Tolerant Digital Systems,* B. W. Johnson: Addison-Wesley, 1989.
2. *Fault-Tolerant Computer System Design,* D. Pradhan, Prentice-Hall, 1996.
3. *Reliable Computer Systems-Design and Evaluation, 2nd edition,* D. Siewiorek and R. Swarz: Digital Press - Butterworth, 1992.
4. *Fault Tolerance in Distributed Systems,* P. Jalote: Prentice Hall, 1994
5. *Performance and Reliability Analysis of Computer Systems*, R. Sahner, K. Trivedi: Kluwer Academic, 1996
6. *Fault Tolerance through reconfiguration of VLSI and WSI arrays*, R. Negrini: MIT Press, 1989.

Topics:

1. Introduction: What is fault and fault-tolerant computing?
2. Hardware Redundancy – Basic Approaches & Models
3. Information Redundancy
4. Evaluation Techniques
   MIDTERM EXAM
5. Testing
6. Check Pointing & Recovery
7. Trends in Fault Tolerant Architecture
8. Fault Tolerant Architecture
9. Research in Fault Tolerant Computing
10. Student Presentations
    FINAL EXAM

Research: An optional research paper may be substituted for the final exam. A student interested in this option will review a subfield of fault-tolerant computing or do original research on a selected topic. A publishable report earns an "A" for the course, regardless of homework and midterm grades. Some of the possible topics are as follows:

- Autonomic computing
- Reliable human-computer interaction
- Recovery oriented computing
- Using spare processor capacity for FT
- Reconfiguration and Embedding in Multiprocessor systems
- Fault-tolerant communication and/or routing
- Roll-back and forward recovery schemes
- Clock synchronization algorithms
- Group communication
- Common Object Request Broker Architecture (CORBA)
- Fault injection
- Fault-tolerant real-time systems

Grading Policy:

Homework	15 %
Research Presentation	10 %
Midterm Exam	35 %
Final	35 %
Attendance	5%

Websites:

Course: http://www.engr.newpaltz.edu/~bai/cse40534/cse40534.html

Search: http://www.google.com
                 http://computer.org/publications/dlib/

Special dates:

March 12	Mid-Point of Spring 2010 semester
March 15- March 19	Spring Break. Classes resume 8:00 a.m. March 22, 2010.
March 29 – March 30	Passover (no classes)
March 31	Last day to withdraw
May 11	Last day of classes for Spring 2010
May 12	Study Day
May 13	Common Exam Day
May 18	Final Exam 12:30 – 2:30 PM in REH 111

Course Rules:

♦ Homework assignments will be posted on the course web site. The due date is typically one week from the assigned date (unless otherwise specified). No late homework set is accepted except under extreme non-academic condition and with the prior approval of the instructor. Any disputed grade must be resolved within with in two class sessions of the return of the graded item.

♦ I strongly advise against missing any classes. If you miss a class, it is your responsibility to obtain assignments and other information given on that day. Attendance will be taken during the first 10 minutes. After that you are considered absent. Three missing class is allowed. You would loose 2% of your grade if you miss a fourth class and 5% after the seventh absence.

♦ Common courtesy is expected in class. Please turn off your cell phone or put it on silent mode while in class.

♦ All your coursework (homework, project, and exams) is expected to be your own. If you are caught cheating on any assignment, you will get an "F" for the course and you will be reported to the university. General instructions such as assisting in problem interpretation, and giving of occasional hints on problem attack (i.e., the kind of help you would get from the instructor or a teaching assistant in the course!), however, are permitted.

♦ During the exam, you may not borrow anything from your classmates i.e. calculator, pens, erasers. You may not talk or ask question of any sort from your classmates. Doing so, can result in a failed grade for the exam or the course.

♦ Please make sure you save your graded homework, test, and report. I may ask for them in case of any grading discrepancy.

From Student Catalog:

Students are expected to maintain the highest standards of honesty in their college work. Cheating, forgery, and plagiarism are serious offenses, and students found guilty of any form of academic dishonesty are subject to disciplinary action.

Cheating is defined as giving or obtaining information by improper means in meeting any academic requirements. The use for academic credit of the same work in more than one course without knowledge or consent of the instructor(s) is a form of cheating and is a serious violation of academic integrity.

Forgery is defined as the alteration of college forms, documents, or records, or the signing of such forms or documents by someone other than the proper designee.

Plagiarism is the representation, intentional or unintentional, of someone else's words or ideas as one's own. Since words in print are the property of an author or publisher, plagiarizing is a form of larceny punishable by fine. When using another person's words in a paper, students must place them within quotation marks or clearly set them off in the text and give them appropriate footnoting. When students use only the ideas and change the words, they must clearly identify the source of the ideas. Plagiarism, whether intentional or unintentional, therefore, is a violation of the property rights of the author plagiarized and of the implied assurance by the students when they hand in work that the work is their own. If students have any questions about what constitutes plagiarism, it is their responsibility to clarify the matter by conferring with the instructor. Faculty members must report in writing cases of cheating, plagiarism or forgery to their department chair and their academic dean.

ADA Policy Statement:
Students with documented physical, learning, psychological and other disabilities are entitled to receive reasonable accommodations. If you need classroom or testing accommodations, please contact the Disability Resource Center (Student Union Building, Room 205, 257-3020). The DRC will provide forms verifying the need for accommodation. As soon as the instructor receives the form, you will be provided with the appropriate accommodations. Students are encouraged to request accommodations as close to the beginning of the semester as possible.