

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

Course Title: Fault-Tolerant Design of Digital Systems Course Number: CSE 40534 Credit: 3 Prerequisite: Graduate Standing or Permission of instructor	Instructor: Dr. Baback Izadi Office: 203 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: Monday and Wednesday Meeting Time: 3:30 PM - 4:45 PM Meeting Room: REH 111	Office Hours: Monday 1:00 – 2:00 PM Tuesday 12:00 PM – 2:00 PM Wednesday 1:00 AM – 2:00 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:

Subject
Faults and their manifestations
Performance and reliability evaluation techniques.
System evaluation and performance reliability tradeoffs
Hardware, software, code and time redundancy techniques
MIDTERM EXAM
Architecture of Fault-Tolerant Computers
Fault tolerance in distributed and Multiprocessor systems.
Real-time fault tolerance
Case study of fault-tolerant systems
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
- ◆ 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	20 %
Research Presentation	20 %
Midterm Exam	30 %
Final	30 %

Websites:

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

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

Special dates:

Monday September 6	No class on this day (Labor Day)
Wednesday September 15	No class on this day after 3 PM (Rosh Hashana)
Tuesday October 12	Evening Classes meet
Friday October 15	Mid-Point of Fall 2004 semester
Friday October 29	Last day for Course Withdrawal
Wednesday November 24 – 26	No classes (Thanksgiving)
December 1	Last day to withdraw from College without failing grades for the semester
December 6	Last day of class
Wednesday, December 15	Final exam: 02:30-04:30PM