New Paltz
STATE UNIVERSITY OF NEW YORK

Division of Engineering Programs

EGE 534 : Fault-Tolerant Design of Digital Systems
(3 credits)
Spring 2017 Semester

Instructor: Dr. Baback Izadi, 213 Resnick Engineering Hall
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Course web page: http://www.engr.newpaltz.edu/~bai/EGE534/EGE534.html

Lecture:	Monday and Thursday	12:30 PM – 1:45 PM, REH110
Office Hours:	Monday	11:00 AM – 12:00 PM
	Tuesday	11:00 AM – 12:00 PM
	Tuesday	1:00 PM – 2:00 PM
	Thursday	11:00 AM – 12:00 PM
	In person or via skype:	baback.izadi
	And by appointment	

Prerequisites: Graduate Standing or EGC442 and permission of instructor

Course catalog description: 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 Learning Outcomes (LO's):
I.   Students will 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.
II.   Students will be introduced to independent and team research to facilitate a recognition for life-long learning.
III.   Students will enhance professional writing and participate in a teamwork skills through term paper presentations.

Textbook:
Fault-Tolerant Systems, I. Koren & C. M. Krishna, Morgan Kaufmann, ISBN: 978-0-12-088525.

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.

Topic	Reference in Text
1. Introduction: What is fault and fault-tolerant computing?	Chapter 1
2. Hardware Redundancy – Basic Approaches & Models	Chapter 2
3. Information Redundancy	Chapter 3
4. Evaluation Techniques	Chapter 2
MIDTERM EXAM March 9, 2017 (Tentative)	
5. Testing	
6. Check Pointing & Recovery	Chapter 6
7. Software Fault Tolerance	Chapter 5
8. Fault Tolerant Architecture	Chapter 7
9. Trends in Fault Tolerant Architecture	Papers
10. Student Presentations	
FINAL EXAM, May 15, 2017 12:30 PM - 2:30 PM	

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.

The research topic may include, but not limited to:

♦ 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:

Homework	20%
Research	10%
Midterm Exam	35%
Final	35%
Total	100%

Course Percentage	Final Grade
90%	A
87%	A-
84%	B+
80%	B
77%	B-
74%	C+
70%	C
62%	C-
Below 62%	F

Websites:
Course: http://www.engr.newpaltz.edu/~bai/EGE534/EGE534.html

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

Rules and general comments:

♦ Each examination and its format will be announced one week prior. Should an exam schedule conflict occur, you should bring it to the instructor's attention as soon as possible. Once you begin an exam, no makeup or other score adjustments will be permitted. Please note the date and time of the final exam and do not schedule any event that will not permit you to take the final at that time.
♦ Homework assignments will be posted on the course web site. The due date is one week from the distribution date (unless otherwise specified). No late homework set is accepted except under extreme non-academic condition and with the prior approval of the instructor.
♦ 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 classes are allowed. You would lose 2% of your grade if you miss a fourth class and 5% after the fifth absence.

- Common courtesy is expected in class. Please turn off your cell phone or put it on silent mode while in class.
- "I" indicates that the student has done satisfactory work in the course, but because of circumstances beyond his control has been unable to finish all requirements. It is not to be given to enable a student to do additional work to bring up a deficient grade.
- Please seek help before serious difficulties in your understanding of course material arise. In particular, it is much better to get your questions answered before an exam than after!
- Please make sure you save your graded homework, test, and report. I may ask for them in case of any grading discrepancy.
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- **Campus-wide Policy Statements**
  a. Academic integrity policy statement. See ww.newpaltz.edu/advising/policies_integrity.html.
  - ✓ 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 any item from your classmates i.e. calculator, pens, erasers. Moreover, you may not talk with your classmates. Doing so can result in a failed grade for the exam or the course.

  b. Reasonable accommodation of individuals with disabilities 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 210, 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.

- **Information on electronic SEIs, which students are encouraged to complete.** You are responsible for completing the Student Evaluation of Instruction (SEI) for this course and for all your courses with an enrollment of five (5) or more students. I value your feedback and use it to improve my teaching and planning.

Please pay attention to the following requirements regarding your homework assignments:

- ✓ Always use standard size (8½ × 11) paper. Do not use papers torn-off from spiral bound notebooks. (maximum penalty 10%)
- ✓ Write the course #, homework set #, and your name on top of the first page, as shown below: (maximum penalty 10%)

  Course #   Homework set #   Your first name Your last name
- ✓ Write clearly, neatly, and in an orderly fashion.   (maximum penalty 10%)
- ✓ Draw schematics and circuit diagrams when applicable. (Maximum penalty 20%)
- ✓ Show steps involved getting to the final answer, no credit may be given for the work not shown.
- ✓ Box-in your final answers.   (Maximum penalty 10%)
- ✓ Staple all homework pages together before you turn them in.   (Maximum penalty 10%)

Special dates:

February 20	President's Day – No classes
March 13	Mid-Point of Spring 2017 semester
March 20- March 24	Spring Break – No classes
March 31	Last day to withdraw from the course
April 11	Passover – No classes
April 26 – May 10	SEI administration
May 9	Last day of classes for Spring 2017
May 10 - 11	Study Day
May 12	Common Exam Day
May 15	Final Exam 10:15 AM – 12:15 PM