

JANUARY 2007

**CAEB**

Approval Date:

<b>Lectures/week</b>	3 hours	<b>Math</b>	20%
<b>Tutorials/week</b>	0 hours	<b>Basic Science</b>	0%
<b>Labs/week</b>	1 hour	<b>Complementary Studies</b>	0%
<b>Weeks/term</b>	12.4	<b>Engineering Science</b>	70%
		<b>Engineering Design</b>	10%

**Course description**

This course covers reliability, availability and fault-tolerant of computer systems. It introduces topics related with fault-tolerant computing and reliability of hardware and software implementation of engineering systems. It includes fail-safe and fail operate computer systems design, qualitative and quantitative analysis of safety-critical systems, risk analysis, fault tolerance techniques, reparability and redundancy. Prerequisites: CS 1303, STAT 2593, CMPE 2422.

**Course Content**

1.	Safety-critical computer system design and evaluation: system design overview, hazard Identification and analysis, mishap risk mitigation, and terminology.	3
2.	Computer system overview: Basic building blocks, CPU, memory, peripherals, and software.	3
3.	Overview on relevant probability equations.	1
4.	Computer system failures: Modes and effects, computer hardware failure modes and effects, software faults and failures.	3
5.	Designing the fail-safe system: simplex fail-safe system architecture, failure detection, system reconfiguration and failure prevention on computer systems, dual redundant architecture, reliability and quality improvements.	7
6.	Evaluation of fail-safe system: Overview, qualitative analyses, risk analysis, mishap risk probability, software, hardware and systematic failure modes, computer system risk and safety-related testing.	3
7.	Design of fail-operate computer systems: Design overview, fail-operate system requirements, redundant hardware architectures, and software redundancy.	7
8.	Reliability: Tree analysis, Markov model analysis, simple numerical methods, advanced mathematical development.	5
9.	Midterm and final exam.	2

**Labs/Projects**

Lab 1.	Simplex system design
Lab 2.	Fail-save system design
Lab 3.	Fail operate system design
Project 1	Failure and reliability of safety-critical systems
Project 2	Safety-critical system design

**Course evaluation**

Assignments	10%	Labs	10%
Midterm	15%	Projects	25%
Final	40%		